135848

FISH KILL # 71-049
STREAM Tye River (Piney (er)
BASIN James River
CITY/COUNTY Piney River

DCP ✓
WSS ✓
Answer
Investigate
Tech. Anal.
Advertise
Board Action
Other

American Cyanamid, though now closed, has for so long grossly degraded the Piney River and better that its effects will probably be noted for years to come. It would appear that heavy rains washed the acidic sediment downstream to a point where there were fish and that this caused the "kill" (no dead fish were seen by the writer as the report came in four days after the kill).

RECOMMENDATIONS:

That the area representative visit American Cyanamid Co and inspect their waste lagoons, etc. to insure against a continual run-off problem from this company.

THE INVESTIGATION

1.0 REPORTED INFORMATION:

Mr. Bill Turner reported young fish died 8/28/71 after heavy rains. Acid ponds from American Cyanamid probably overflowed into stream.

Reported by: W.E. Turner Date 8/31/71 Time 0815
Report received by: R. Pitts Date 8/31/71
Investigated by: D.P. Chance Date 8/31/71
Investigated by: Date
Investigated by: Date
Final Report Edited by:

CHAIN OF NOTIFICATION (list of names in order of contact)

(1) Pollution Abatement Division (name) J. Canaday (date) 8/31 (time) 0930
(2) Enforcement Division (name) R. Bowles (date) 8/31 (time) 0930
(3) (name) (date) (time)
(4) (name) (date) (time)

DATE FISH KILL OCCURRED (as determined by investigation) 8/28/71
DATE FISH KILL ENDED 8/28/71

PLAINTIFF'S EXHIBIT 27

RECEIVED
NOV 19 1971
STATE WATER CONTROL BOARD
Central Regional Office

100014

sh Kill No. 71-049

Weather Previous to Kill rain (approx. 1 - 1.25 inches)
Weather During Kill -
Weather Following Kill clear
(If rain - include amount)

WITNESSES: name Bill Turner
address Richmond
phone
position

2.0 INVESTIGATORS DISCUSSION:

The writer traveled to the town of Piney River in an effort to determine whether or not the American Cyanamid Co. could be responsible for the kill (The Piney River flows into the Tye River). Due to the lateness of the fish kill report and the lack of information given the writer felt there was little chance of actually locating any dead fish or of proving a cause for their death.

The pH values above the American Cyanamid Co. ranged from 8.0 to 9.0, below the plant, at Rose's Mill, the pH was below 4.0 (off the Hach Kit scale) and the bottom was covered with a yellow sediment. The writer then talked with Mr. H.W. Whitehead of the American Cyanamid Co. who explained that this was a normal condition below the plant and that he doubted there were any fish in the Piney River of Tye River until the confluence with the James River.

The American Cyanamid Co. is no longer in operation and is in the process of closing down. However, it would appear that the residual effects of their operation will be evident for some time to come.

Fish Kill No. 71-049

2.1 STATION DESCRIPTION:

1. Piney River at Rt. 151 bridge above American Cyanamid
2. Piney River at 674 bridge below American Cyanamid
3.
4.
5.
6.
7.
8.
9.
10.

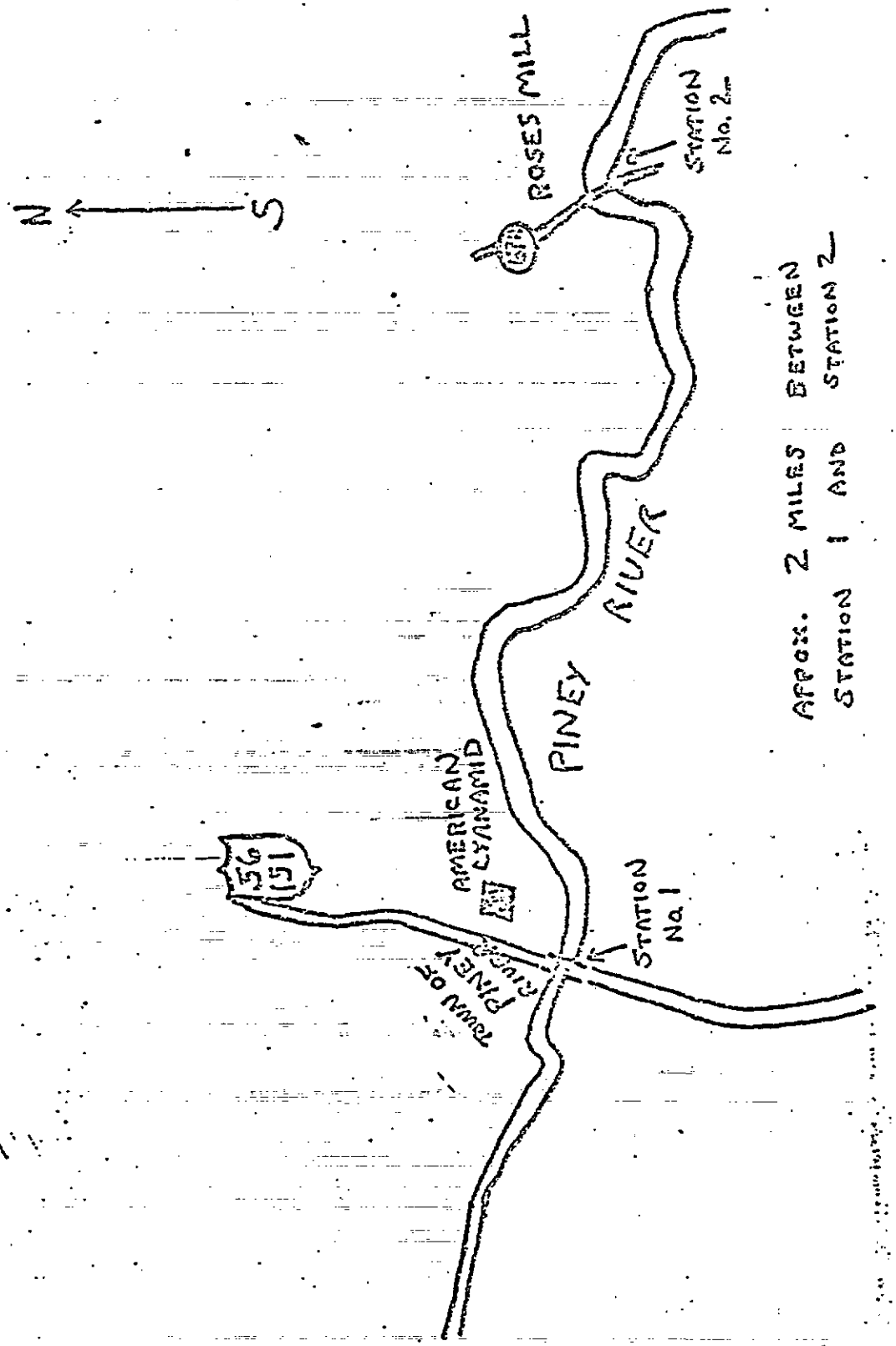
.2 PICTURES TAKEN: (identify pictures: slides (s) or prints (p))

Location:

1. _____
2. 2 pictures
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Kill No. 71-049

3.0 MAP OF AREA: Include company layout, discharges in area, exact extent of kill, extent of visual stream degradation.



100017

n Kill No. 71-049

4.0 VISUAL OBSERVATIONS:

.1 WATER:

Station	D.O. mg/l	pH	Temp. (°F)	Dead Fish ?	Color	Turbidity
1	7.0	9.0	78	-	-	clear
2	2.6	4.0-	76	-	yellow	cloudy
3						
4						
5						
6						
7						
8						
9						
10						

Station	Floating Solids	Surface Film	Flow	Tide Stage	Odor (def)	Other
1	none	none	med	-	none	
2	none	none	med	-	none	bottom sediment yell
3						
4						
5						
6						
7						
8						
9						
10						

100018

Kill No. 71-049

EYES: *

normal _____ bulging _____
opaque _____ one eye missing _____
white: lens _____ or center _____ both eyes missing _____
tiny spots in lens _____ if a needle is inserted in the eye socket
red spots in cornea _____ and the eye is pressed while fish head is
popeye _____ under water, gas bubbles _____ or opaque
other _____ fluid _____ escapes.

* Indicate approximate number of fish having these characteristics. Look for general trends, not specific fish. (few, many, all, none)

OTHER CONDITIONS OR SYMPTOMS NOTED:

no dead fish seen by investigator

5.0 SAMPLES AND ANALYSES:

5.1 CHEMICAL SAMPLES COLLECTED:
(circle samples not collected by State Water Control Board)

source (pollution) _____ polluted area _____
source (oil) _____ spill area _____
1/2 gallon glass 2 quart plastic 2
gallon plastic _____ quart glass _____
mercury bottles _____ mud _____
_____ soil _____

5.2 BIOLOGICAL SAMPLES COLLECTED: *
(circle samples not collected by State Water Control Board)
Fish must be properly identified to genus on lab sheet

fish _____ benthic _____
oyster _____ clam _____
crab _____ mussel _____
other _____ other _____

* Specify whole fish, edible meat or organs to be analized

100019

No. _____

CHEMICAL ANALYSIS
check box for requested analysis

tion	2				
	8/31/71				
ab Number	1730				
	10446				
Parameter	Piney River at Rt. 674				
BOD_5, mg/l					
MPN / 100 ml					
pH (laboratory	3.0				
Acidity (total) mg/l	165				
Alkalinity (total), mg/l					
Path Alkalinity, mg/l					
Settleable Solids, mg/l					
Total Solids - tot, mg/l					
Vol, mg/l					
Fix, mg/l					
Susp. Solids- Tot, mg/l					
Vol, mg/l					
Fix, mg/l					
Chlorides, mg/l as Cl					
Nit, kjel, mg/l as N					
Ammonia, mg/l as N					
Nitrite, mg/l as N					
Nitrate, mg/l as N					
Hydrol. Phosphates, mg/l as P					
Ortho Phosphates, mg/l as P					
Total Phosphates, mg/l as P					
Chromium Tot, mg/l					
Zinc, mg/l					
Lead, mg/l					
Iron, mg/l					
Copper, mg/l					
Manganese, mg/l					
Hexane Extractables, mg/l					
Chemical Oxygen Demand, mg/l					
by Infrared, mg/l					
Sulfates	182 mg/l				
					100020

n Kill No. 71-049

6.0 TOXICITY OF ELEMENTS INVOLVED AS REPORTED IN LATEST LITERATURE:

EFERENCE: Ellis reports that the pH values of most inland waters containing fish range between 6.7 and 8.6, with extremes of 6.3 and 9.0. (McKee and Wolf, 1963)

REFERENCE: Cole states that fish are euryionic and can live in a wide pH range, with limits as broad as 4.7 to 8.7. (McKee and Wolf, 1963)

REFERENCE: The Aquatic Life Advisory Committee of the Ohio River Valley Water Sanitation Commission concluded that direct lethal effects of pH are not produced within a range of 5.0 to 9.5, but from the standpoint of productivity it is best to maintain the pH in the range of about 6.5 to 8.2. (Mckee and Wolf, 1963)

REFERENCE:
A pH of 5.5 as the lower limit for general fish protection.
(McKee and Wolf, 1963)

Many additional references are available to prove the adverse effects of low pH.

REFERENCE:

EMARKS: In U.S. waters that support good game fish, 5 percent of the waters contain less than 11 mg./l. of sulfates, 50 percent less than 32 mg./l. , and 95 percent less than 90 mg./l. .

7.0 BENTHIC, ALGAL EXAMINATION (CURSORY):

Station	Substrate	Aquatic plants	Algae	Benthic animals	Tolerance %			How compare with control
					Tol	Fac	Sensit	
1	rocks			numerous				
2	rocks			nonexistent				
3								
4								
5								
6								
7								
9								
10								

100021

sh Kill No. 71-049

0 ROUGH FIGURES FOR FISH COUNT:

8.1 Lake, pond or river; total count of every fish: no count, kill old, no dead fish seen

OR

8.2 100 yard segment/half mile area count; lake or river: _____

Segment	species, No., size	species, No., size	species, No., size
(1st. fish seen) 1st. 100 yds.			
2nd 100 yds.			
3rd 100 yds.			
4th 100 yds.			
5th 100 yds.			
6th 100 yds.			
7th 100 yds.			
8th 100 yds.			
9th 100 yds.			
(last fish seen) 10th 100 yds.			

(continue on last page if necessary)

Total distance of kill in stream/pond miles/acres: unknown

Field investigator will not calculate total number of fish killed.

9.0 COST:

Cost of investigation: Technical Services Division, Individual sheets: 60.58
Enforcement: _____, Pollution Abatement: _____
Other: _____ Other: _____
Cost of freshwater fish (Commission of Game and Inland Fisheries): _____
Cost of marine fish: _____
Other cost (explain): _____
Total cost to State of Virginia: _____
Total cost includes only those cost of investigation and reporting.

pies: Director Technical Services Division, Asst. Director Technical Services Div., (2) Pollution Abatement Div. (2), Enforcement Div., Biology File, Commission of Game and Inland Fisheries, Investigator.

Report completed and distribution made: _____

Enclosures:

100022

Fish Kill No. 71-049

MISC. NOTES:

Mr. Whitehead was most cooperative and very informative. He explained the American Cyanamid Co. had long ago killed all fish below the plant as far down as the James River. He also said that their operation had been inspected on numerous occasions by Water Control Board personnel and that their people were aware of the plant's effect on the river.

Lab results confirm the low pH value recorded in the field. High sulphur concentrations in the water at Station 2 and on the bottom would indicate the possibility of a continuing acid problem despite the fact that the American Cyanamid Co. has closed.

VIRGINIA STATE WATER CONTROL BOARD
Fish Kill Investigation # 71-04C

Itemized below are expenses incurred by the Virginia State Water Control Board during the subject fish kill investigation.

Number of personnel involved in investigations: 1 + lab

Total man-hours infield, laboratory and report preparation: 12

Total wage expense based on hourly rate for all participants:---------- 36.00 + 1.54 lab

Total number of miles driven by State car: 263

Total number of miles driven by private car: —

Total mileage expense for use of State car (8¢/mile)---------- 21.04

Total mileage expense for use of private car (9¢/mile)---------- —

Total expense for travel by train, plane or bus:---------- —

Boat Use:

Type of Boats	Check Boat or boats used	Rate/ day	No. days used	Total Expense
Canoe		$6.25		
Flatbottom		$6.25		
Glassmaster		$15.00		
MFG Carosel		$31.65		
Boat Rentals				

Total expense for Boat use:---------- —

Total number of nights spent in field for all participants: —

Total expense for lodging:---------- —

Total number of meals for all participants: 1

Total expense for meals:---------- 2.00

Miscellaneous Items: (Itemize below if not listed)

Items	Quantity	Valve
Ice		
Foils		
Movie Film		
Still camera film		

Total expense for miscellaneous items:---------- —

TOTAL EXPENSES 60.58

SIGNED BY David P. Chase

100024

VRO

F

COMMONWEALTH of VIRGINIA

STATE WATER CONTROL BOARD
2111 Hamilton Street

R. V. Davis
Executive Secretary

Post Office Box 11143
Richmond, Virginia 23230
(804)786-1411

September 27, 1977

SPECIAL DELIVERY

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

RECEIVED
SEP 28 1977
VALLEY REGIONAL OFFICE

Mr. Henry A. Williams
Mr. Ronald A. Penque
United States Titanium Corporation
305 East 37 Street
Paterson, New Jersey 07504

Gentlemen:

Enclosed is the fish kill investigation report which was referenced in Mr. David E. Evans' letter of September 16, 1977. The Board requested U.S. Titanium to pay, by October 15, 1977, for the cost of the fish kill that resulted from the July discharges at the Piney River plant.

Under Section 62.1-44.15(11) of the Code of Virginia (1950), as amended, the State Water Control Board is authorized to recover the cost of staff investigation and the replacement value of the fish killed. The cost of the fish as determined by the Commission of Game and Inland Fisheries was $7,047.03. The cost of the staff investigation was $2,193.42. The total cost to the State of Virginia was $9,240.70. Should U. S. Titanium fail to pay for the fish kill, the Board will proceed with court action to collect such costs.

The Board's staff is currently reviewing the proposed agreement, between Penque-Williams, Inc. and Cosmin Corporation, in which Penque-Williams will sell and deliver copperas to Cosmin's Baltimore plant site. The term of this agreement is for five years instead of the reported 1,000 days or four years as stated by U. S. Titanium at the Board's September 9, 1977 Special Order Hearing. The staff requests that U.S. Titanium explain the additional year's time found in the Penque-Williams, Cosmin agreement.

PENGAD-Bayonne, N.J.
PLAINTIFF'S EXHIBIT
130

100025

The staff is willing to work with U.S. Titanium in any way possible to resolve the pollution problems at its Piney River plant site. If you require any assistance, please do not hesitate to contact our staff.

Very truly yours,

Jim E. Hensley
Specialist
Bureau of Enforcement

dd
cc: David E. Evans, Asst. Attorney General
Valley Regional Office, SWCB
Bureau of Applied Technology, SWCB
Division of Ecological Studies, SWCB
Bureau of Enforcement - Fish Kills

FISH KILL REPORT

FISH KILL # 78-038
STREAM Piney River/Tye River
BASIN James
~~XXX~~/COUNTY Nelson/Amherst

DRAFT This report is not in file for NL yet

SUMMARY:

In August of 1977, 8940 fish were killed valued at $ 4,762.14. Many different species were involved in the kill including chubs, minnows, smallmouth bass, sunfish, suckers and catfish. The sampling results show U.S. Titanium as the pollution source causing an extremely low pH downstream of their discharge pipe. Total cost to State of Virginia - $5122.88.

ORIGINAL (Red)

THE INVESTIGATION

1.0 REPORTED INFORMATION:

Fish were dead and dying on the Tye River and the water appeared cloudy and had a "sour taste". Members of C.L.E.A.N. reported discharges from U.S. Titanium the preceeding weeks and at 5:30pm on August 19, 1977.

Reported by: Bruce Leider Date 8-19-77 Time
Report received by: Mike Shelor Date 8-19-77
Investigated by: C. L. Auckerman Date 8-20-77
Investigated by: T. Blankenship Date 8-20-77
Investigated by: Ron Gregory Date 8-20-77
Final Report Edited by: B. Gail Todd

CHAIN OF NOTIFICATION (list of names in order of contact)

(1) Enforcement Division (date) (time)
(2) Regional Representative (date) (time)
(3) Game Warden (CGIF) (date) (time)
(4) (name) (date) (time)
(5) (name) (date) (time)

DATE FISH KILL OCCURRED (as determined by investigation) 8-19-77
DATE FISH KILL ENDED unknown

100027

1.1

Fish Kill No. 78-038

ORIGINAL
(Red)

Weather Previous to Kill _____
Weather During Kill _____
Weather Following Kill _____
(If rain - include amount)

WITNESSES: name Bruce Leider
address Rt. 1, Box 385, Arrington, Va. 22922
phone (804) 263-4509
position _____

2.0 INVESTIGATORS DISCUSSION:

R. Gregory and other DES personnel met with C. Auckerman, T. Blankenship, and B. Leider on August 20 to investigate the fish kill. They visited the U.S. Titanium plant site where a discharge was observed. Next a fish count was made from the U.S. Titanium discharge to a point on the Tye River downstream of the community of Tye River. Water samples that had been collected by a C.L.E.A.N. member were given to T. Blankenship on August 20 who then gave them to R. Gregory. Fish samples were also collected and given to D. Paylor who examined them on August 19. (see attached pathology report).

Fish Kill No. 78-038

2.1 STATION DESCRIPTION:

ORIGINAL (Red)

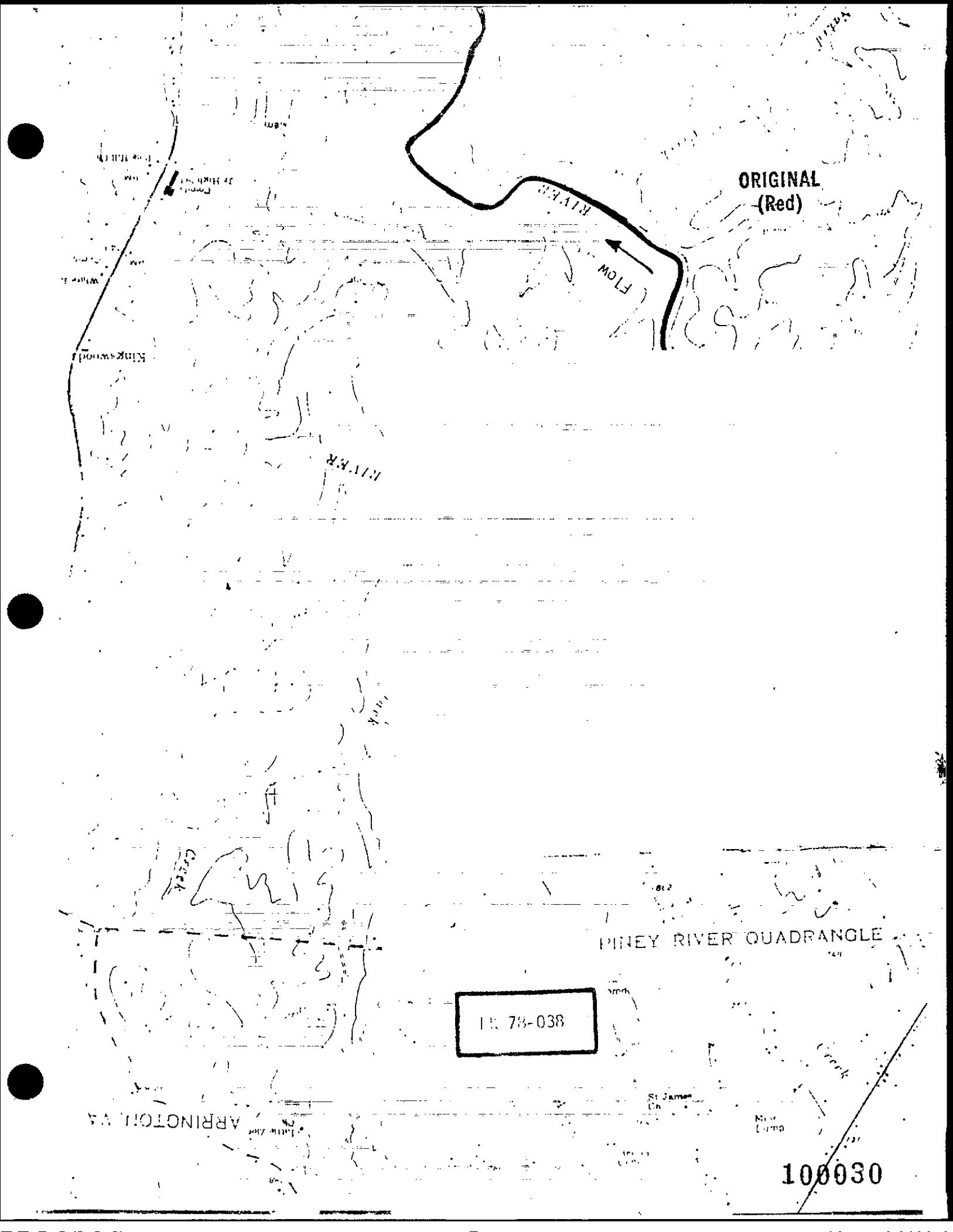
1. U.S. Titanium plant, 100 yds above discharge pipe
2. U.S. Titanium plant, sample taken from discharge pip
3. U.S. Titanium plant, 100 yds below discharge pipe
4. Tye River at Rt. 29 bridge
5. Tye River at 10 ft hole 2 miles below Tye River Post Office
6.
7.
8.
9.
10.

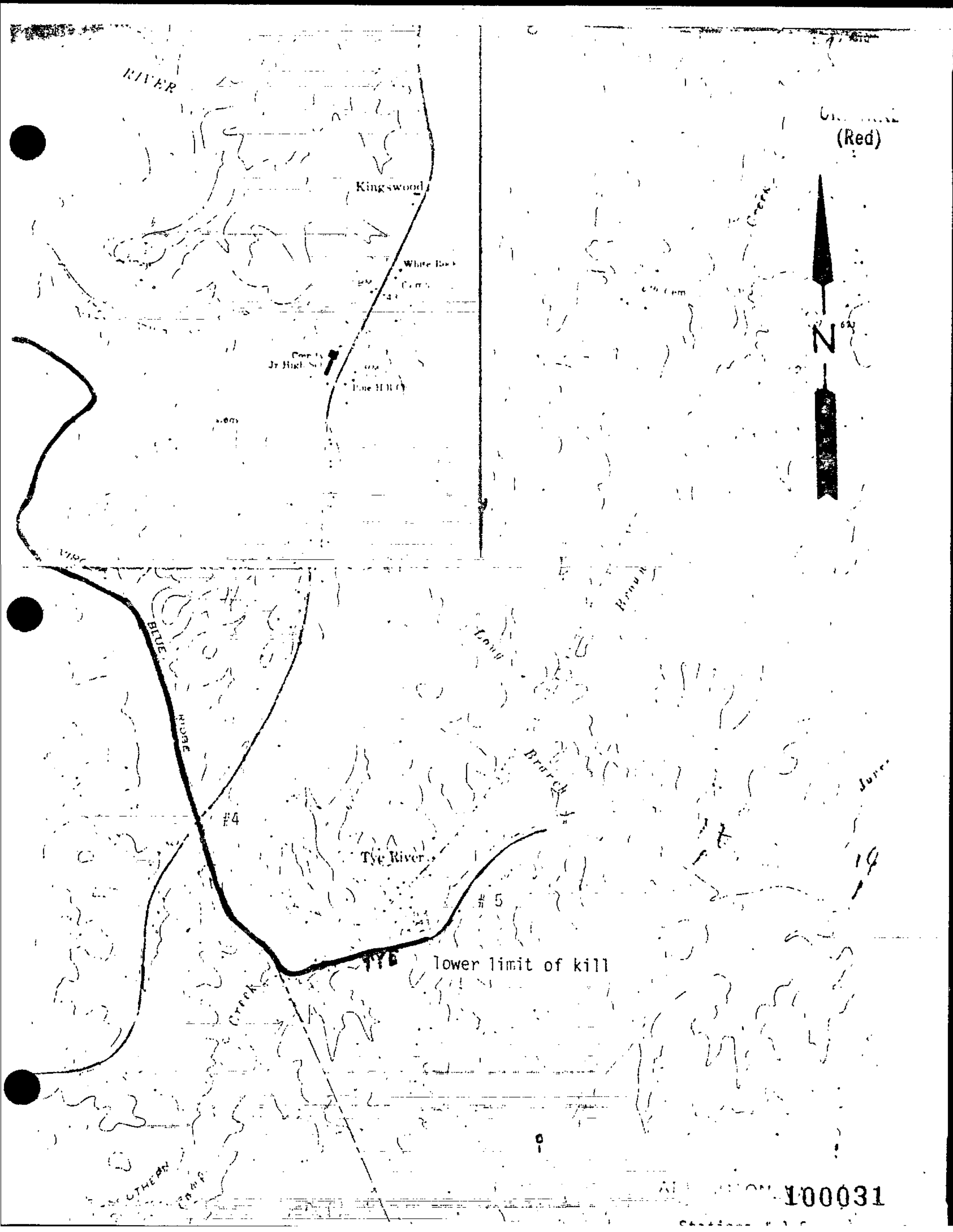
2.2 PICTURES TAKEN: (identify pictures: slides (s) or prints (p))

Location: No pictures available

1. _____ 6. _____
2. _____ 7. _____
3. _____ 8. _____
4. _____ 9. _____
5. _____ 10. _____

100029


ORIGINAL
(Red)
FLOW
PINEY RIVER QUADRANGLE
IR 78-038
ARRINGTON, VA
100030


RIVER
(Red)
Kingswood
White Rock
Creek
N
BLUE
RIDGE
Long
Branch
#4
Tye River
5
TYE
lower limit of kill
Creek
100031

Fish Kill No. 78-038

ORIGINAL
(Red)

EYES: *

normal	bulging
opaque	one eye missing
white: lens or center	both eyes missing
tiny spots in lens	if a needle is inserted in the eye socket
red spots in cornea	and the eye is pressed while fish head is
popeye	under water, gas bubbles or opaque
other	fluid escapes.

* Indicate approximate number of fish having these characteristics. Look for general trends, not specific fish. (few, many, all, none)

OTHER CONDITIONS OR SYMPTOMS NOTED:

5.0 SAMPLES AND ANALYSES:

5.1 CHEMICAL SAMPLES COLLECTED:
(circle samples not collected by State Water Control Board)

source (pollution) X	polluted area
source (oil)	spill area
1/2 gallon glass	quart plastic
gallon plastic	quart glass 3
mercury bottles	mud
	soil
	two quart glass 2

5.2 BIOLOGICAL SAMPLES COLLECTED: *
(circle samples not collected by State Water Control Board)
Fish must be properly identified to genus on lab sheet

fish 3 (SMB, chub, longear, sunfish)	benthic
oyster	clam
crab	mussel
other	other

* Specify whole fish, edible meat or organs to be analized

100032

Fish Kill No. 78-038

5.3 CHEMICAL ANALYSIS
check box for requested analysis

ORIGINAL
(Red)

Station	1	2	3	4
Date	8-19-77	8-19-77	8-19-77	8-19-77
Time	2230	2245	2300	2000
Lab Number	018124	018125	018126	018127
Parameter -				
BOD_5, mg/l				
MPN / 100 ml				
pH (laboratory)	5.1	2.5	2.5	6.4
Acidity (total) mg/l	18			
Alkalinity (total), mg/l		22,100	13,800	11
Phth Alkalinity, mg/l				
Settleable Solids, mg/l				
Total Solids - tot, mg/l				
Vol, mg/l				
Fix, mg/l				
Susp. Solids- Tot, mg/l				
Vol, mg/l				
Fix, mg/l				
Chlorides, mg/l as Cl				
Tot Nit, kjel, mg/l as N				
Ammonia, mg/l as N				
Nitrite, mg/l as N				
Nitrate, mg/l as N				
Hydrol. Phosphates, mg/l as P				
Ortho Phosphates, mg/l as P				
Total Phosphates, mg/l as P				
Chromium Tot, mg/l				
Zinc, mg/l				
Lead, mg/l				
Iron, mg/l	1.7	1,100	7.0	0.3
Copper, mg/l				
Manganese, mg/l				
Hexane Extractables, mg/l				
Chemical Oxygen Demand, mg/l				
Oils by Infrared, mg/l				
Hardness	23	600	90	40
Sulphate	37	7600	700	19
				100033

Fish Kill No. 78-038

ORIGINAL
(Red)

5.3 CHEMICAL ANALYSIS
check box for requested analysis

Station	5				
Date	8-19-77				
Time	2000				
Lab Number	018128				
Parameter					
BOD_5, mg/l					
MPN / 100 ml					
pH (laboratory)	6.3				
Acidity (total) mg/l					
Alkalinity (total), mg/l	8				
Bath Alkalinity, mg/l					
Settleable Solids, mg/l					
Total Solids Tot, mg/l					
Vol, mg/l					
Fix, mg/l					
Susp. Solids Tot, mg/l					
Vol, mg/l					
Fix, mg/l					
Chlorides, mg/l as Cl^-					
Total Kjl, Diss, mg/l as N					
Ammonia, mg/l as N					
Nitrite, mg/l as N					
Nitrate, mg/l as N					
Hydrol. Phosphates, mg/l as P					
Ortho Phosphates, mg/l as P					
Total Phosphates, mg/l as P					
Dissolved O2, mg/l					
Zinc, mg/l					
Iron, mg/l					
Iron, mg/l	0.6				
Copper, mg/l					
Manganese, mg/l					
Total Alkalinity, mg/l					
Methyl Orange Alk, mg/l					
Calcium Hardness, mg/l					
Hardness	58				
Sulphate	20				

100034

Fish Kill No. 78-038

ORIGINAL
(Red)

6.0 TOXICITY OF ELEMENTS INVOLVED AS REPORTED IN LATEST LITERATURE:

REFERENCE: Mount, Donald. 1973. Chronic Effect of Low pH on fathead Minnow Survival, Growth, and Reproduction. "Most letal pH values from laboratory data reported in the literature are below 4.0".

REFERENCE: McKee & Wolf. 1963. "A pH of 5.5 as the lower limit for general fish protection".

REFERENCE: McKee & Wolf. 1963. "Cole states that fish are euryonic and can live in a wide pH range, with limits as broad as 4.7 to 8.7".

REFERENCE: The Environmental Protection Agency in Quality Criteria for Water, 1976, sets the criteria for freshwater aquatic life at 6.5-9.0. "Outside of this range, fish suffer adverse physiological effects increasing in severity as the degree of deviation increases until lethal levels are reached." (p.341)

REMARKS: The extremely low pH values found at the discharge pipe and 100 yds. below U.S. Titanium at the time of the sampling would be immediately toxic to fish. It is evident that such values caused the fish kill in the Piney-Tye River.

7.0 BENTHIC, ALGAL EXAMINATION (CURSORY):

tation	Substrate	Aquatic plants	Algae	Benthic animals	Tolerance %			ilow compare with contro
					Tol	Fac	Sensit	
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

100035

Fish Kill No. 78-038

ORIGINAL
(Red)

8.0 ROUGH FIGURES FOR FISH COUNT:

8.1 Lake, pond or river; total count of every fish: _____

OR

8.2 100 yard segment/half mile area count; lake or river: 8,940

Total distance of kill in stream/pond miles/acres: _____

Segment	Species, No. size	Species, No., size	Species, No., Size
(1st. fish seen) 1st. 100 yds.	See fish cost sheet		
2nd. 100 yds.			
3rd. 100 yds.			
4th. 100 yds.			
5th. 100 yds.			
6th. 100 yds.			
7th. 100 yds.			
8th. 100 yds.			
9th. 100 yds.			

100036

Fish Kill No. 78-038

ORIGINAL
(Red)

9.0 COST:

Cost of investigation: Bureau of Surveillance and Field Studies, Individual sheets: 315.49 Enforcement _____
Other: _____
Cost of freshwater fish (Commission of Game and Inland Fisheries): 4,762.14
Cost of marine fish: _____
Other cost (explain): Lab cost - 20.25, administrative cost 25.00
Total cost to State of Virginia: 5122.88

Copies: Director BSFS, Regional Office, Enforcement, DES File (orig.),
Commission of Game and Inland Fisheries, Investigator, HATS File

Report completed and distribution made: _____ _____
(signed) (date)

Enclosures:

MISC. NOTES:

100037

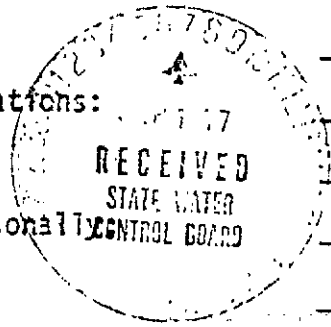
R. Gregory - DES

Pollution Complaint No. _____ Fish Kill Investigation No. _____ Date _____

NAME: _____

TITLE: _____

ORIGINAL (Red)



Present Wage earnings per hour: _____

Total man-hours in field, laboratory, and report preparations: _____

Total wage expense based on hourly rate: _____

Total number of miles driven by State or Agency car personally: _____

Total number of miles driven by private car personally: _____

Total mileage expense for use of State car (9¢ per mile): _____

Total mileage expense for use of Agency car (10¢ per mile): _____

Total mileage expense for use of Private car (12¢ per mile): _____

Type of boat used by you personally: _____

Rates for boats while unavailable for other use:

	Daily Cost	Operating Cost Hourly
Canoe and Flatbottom (narrow)	$ 6.25	$ 3.00
Wide flatbottom	8.50	4.00
Bassmaster 17' outboard	15.00	6.50
Bassmaster 19' outboard	25.00	7.50
Bassmaster 19' inboard	31.00	8.50
Houseboat	31.00	8.50
Chris 'N' Ski 23' and Sea-Craft 24' Inboard	37.00	9.00
Other		

Number of days boat was used: _____

Number of hours boat was in operation: _____

Total expense for boat use: _____

Total number of nights spent in field: _____

Total expense for lodging: _____

Total number of meals: _____

Total expense for meals: _____

Tolls (ferry, tolls, etc.) Itemize below:
(No. of Items) (Total Value)

Expenses for Misc. Items: _____

TOTAL EXPENSES: _____

100038

ORIGINAL
(Red)

INDIVIDUAL'S EXPENSE
FISH KILL INVESTIGATION

FISH KILL NO. 78-038

NAME: David K. Paylor

TITLE: P.C. Specialist A

Present wage earnings per hour: 5.77

Total man hours in field, laboratory and report preparation: 24

Total wage expense based on hourly rate 138.48

Total number of miles driven by state car personally: 265

Total mileage expense for use of state agency, pool car (.15 per mile): 39.75

Total number of miles driven by private car personally: _____

Total mileage expense for use of private car.(per mile): ..... _____

Total expense for travel by train, plane or bus. ..... _____

Type of boat used by you personally: _____

Rate for boat use:	Daily Cost	Hourly operating cost
Canoe and Flatbottom (narrow)	$ 6.25	$ 3.00
Wide Flatbottom	8.50	4.00
Glassmaster 17' Outboard	15.00	6.50
Glassmaster 19' Outboard	25.00	7.50
Glassmaster 19' Inboard	31.00	8.50
Carousel	31.00	8.50
Fish/Ski, T-Craft	37.00	9.00

Number of days boat was used:

Number of hours boat was used:

Total expense for boat use: _____

Total number of nights spent in field: _____

Total expense for lodging: _____

Total number of meals: 2

Total expense of meals: 7.85

Miscl. items (ice, film, tolls, etc.) Itemize below:

(No. of items) (Total value)

Total expense for Miscl. items: _____

TOTAL EXPENSES 186.08

Effective date: _____

Signature David K. Paylor

Date Sept 22, 1977

100039

ORIGINAL
(Red)

LABORATORY COSTS

Fish Kill No. 78-038

PARAMETER	no. of analyses	cost per analysis	total cost		PARAMETER	no. of analyses	cost per analysis	total cost
Coliform, Total /100 ml					Arsenic			
Coliform, Fecal /100 ml					Cadmium			
pH (Laboratory)	5	1.00	5.00		Calcium			
Alkalinity/Acidity	5				Chromium			
Total Solids, Total					Copper			
Volatile				X	Iron	5	.55	2.75
Fixed					Lead			
Suspended Solids, Total					Magnesium			
Volatile					Manganese			
Fixed					Mercury			
Dissolved Solids					Zinc			
Chloride								
Hardness	5	1.00	5.00					
Nitrogen, Total Kjeldahl								
Phosphorus, Total								
Phosphorus, Ortho								
Ammonia mg/l as N					Turbidity			
Nitrite mg/L as N					Pesticides			
Nitrate mg/L as N					Settleable Solids			
Sulphate	5	1.50	7.50		Conductivity			
Hexane Extractables								
BODs								
COD								

Effective date August 1977

Grand Total $ 20.25

Approved by _____
(Authorized Signature)

100040

RIVER Piney River/Tye River

CITY/COUNTY Nelson/Amherst

REPLACEMENT COST OF FISH

ORIGINAL (Red)

Fish Kill No. 78-038

Species & Common Name	Size (Inches)	Number	Individual Value	Total Value
Cyprinidae (chubs &	all	3705		
& minnows)				
Percidae (darter)	all	158		
Micropterus dolomieui	2	246		
(smallmouth bass)	3	1681		
	4	1487		
	5	625		
	6	132	71	
	7	35		
	10	9		
Lepomis (sunfish)	1	18		
	2	114		
	3	79		
	4	79		
	5	70		
	6	18		
	7	9		
Catostomidae (sucker)	1-3	176		
	4-6	114		
Carpiodes (carp sucker)	5	18		

SUB Grand Total 8773 $4,744.49

Signed: [signature]
(Chief, Fish Division, CGIF)

Date: June 2, 1980

100041

Form 36-75

Piney River/Tye River

Y/COUNTY Nelson/Amherst

REPLACEMENT COST OF FISH

Fish Kill No. 78-038

ORIGINAL (Red)

Species & Common Name	Size (Inches)	Number	Individual Value	Total Value
Noturus (madtom)	?	158	.11	17.38
Ictalurus (catfish)	2	9	1.03	9.27

Sub-total 17.65

Grand Total 8940 $4,762.14

Signed: [signature]
(Chief, Fish Division, CGIF)

Date: June 2, 1980

Form 36-75

100042

PATHOLOGY REPORT

ORIGINAL
(Red)

Name David K. Paylor Fish kill # 78-038

Species smallmouth bass Date Received
Size 2" Date Examined 8/19/77
Sex Examined moribund ____ dead x
Preservative frozen Sampled moribund ____ dead ____

I External

Sides (hemorrhaging, necrosis, parasites, bacteria, etc.):
normal

Fins (hemorrhaging, necrosis, parasites, bacteria, fraying, etc.):
normal

Gills: A. General appearance & color: normal postmortum appearance

B. Microscopic (hemorrhaging, hyperplasia, aneurysms, bacteria, parasites):
some foreign material between lamellae

Other abnormalities:

II Internal

General appearance of viscera (hemorrhaging, edema, parasites, etc.):

normal
Intestinal tract (full, empty, bloody, mucous, parasites, etc.):

normal
Organs (hemorrhaging, color, bacteria, parasites, etc.): normal

Liver: Spleen:

Pyloric caeca:
Kidney:

Swim Bladder:

Gall Bladder: Other:

III Hematology, Histology, Bacteriology, Parasitology --- attach sheets

IV Summary and Conclusions:

Postmortum changes and decay were advanced, possibly due to the small size of the fish. Some foreign material was found between the lamella on microscopic examination. It was much less abundant than the two larger fish examined (longear and chub).

David K. Paylor
9/22/77

100043

ORIGINAL
(Red)

PATHOLOGY REPORT

Name David K. Paylor — Fish Kill # 78-038

Species longear sunfish/chub — Date Received
Size 5"/7" — Date Examined 8/19/77
Sex — Examined moribund ___ dead x
Preservative frozen — Sampled moribund ___ dead ___

I External

Sides (hemorrhaging, necrosis, parasites, bacteria, etc.):
normal

Fins (hemorrhaging, necrosis, parasites, bacteria, fraying, etc.):
normal

Gills: A. General appearance & color: Completely covered with red-brown material. Outer gill arch completely engulfed.
B. Microscopic (hemorrhaging, hyperplasia, aneurysms, bacteria, parasites): Foreign substance between lamellae.

Other abnormalities:

I Internal

General appearance of viscera (hemorrhaging, edema, parasites, etc.):
Normal

Intestinal tract (full, empty, bloody, mucous, parasites, etc.):
Normal

Organs (hemorrhaging, color, bacteria, parasites, etc.): Normal

Liver: — Spleen:

Kidney: — Pyloric caeca:

Swim Bladder:

Gall Bladder: — Other:

Hematology, Histology, Bacteriology, Parasitology --- attach sheets

Summary and Conclusions:

The only pathologic condition observed was the collection of foreign red-brown colored material on the gills (see slides). This was unidentified (the frozen gills have been retained) but was in sufficient quantity to have caused death by physical blockage alone. Other factors may also have been involved.

David K. Paylor
9/23/77

100044

MEMORANDUM

ORIGINAL
(Red)

State Water Control Board

2111 North Hamilton Street | P. O. Box 11143 | Richmond, VA. 232

SUBJECT: Piney River - Tye River Fish Kill, FK 78-038

TO: VRO File

FROM: C. L. Auckerman CLA

DATE: 24 August 1977

COPIES: DES

On 19 August 1977 at 9:00 P.M. the writer received a call from M. H. Shelor (Prep Duty Officer) reporting a fish kill on the Tye River. The writer then contacted Bruce Leider (Rt. 1, Box 385, Arrington 22922, Phone 804-263-4509) who reported that he had observed dead and dying fish on the Tye River at the Route 29 bridge and at a point two miles downstream. Mr. Leider was in the area at 1:00 P.M. that afternoon when the water appeared clear and no dead fish were seen. When he noticed dead fish at 8:00 P.M. the water appeared somewhat cloudy and had a "sour taste". Samples of water and distressed fish were collected by Mr. Leider.

It was also reported by Mr. Leider that members of C.L.E.A.N. had noted discharges of 5-10 gpm at the U. S. Titanium plant site on several occasions during the two weeks preceding the kill. A discharge of about 5 gpm was observed at the site on 19 August at 5:30 P.M. Samples of that discharge as well as from Piney River above and below the discharge were collected by C.L.E.A.N. after the kill was discovered. The source of discharge was not an overflow from the catch basin, but from a leak at the pumphouse and runoff not entering the catch basin.

After discussing the above with D. K. Paylor of DES, it was deemed that no further investigation would be necessary until the following morning. On the morning of 20 August the writer and T. Blankenship met with investigators from DES and with Bruce Leider. R. A. Gregory assumed responsibility for the investigation. The U. S. Titanium plant site was visited where a discharge was observed. A fish count was made from the U. S. Titanium discharge to a point on Tye River downstream of the community of Tye River.

CLA/jw

100045

MEMORANDUM

ORIGINAL
(Red)

~~THS~~ File -

State Water Control Board

2111 North Hamilton Street | P. O. Box 11143 | Richmond, VA. 232

SUBJECT: Piney River Survey - SS 2-11-76

TO: File

FROM: R. F. Tesh RFT

DATE: 15 August 1975

COPIES: M. A. Bellanca - BSFS
R. Bradley Chewning
R. L. Hill
A. H. Paessler
J. A. Preston

This memorandum constitutes the final report for SS 2-11-76. The memorandum initiating the study is attached.

The reach of Piney River in question is referenced in the 305(b) Report as receiving large amounts of acidic ferrous sulfate leachate from the former American Cyanamid Company site. Progress has been made during the recent past to eliminate the leachate. Presently, all leachate is being pumped to a holding pond such that no known leachate enters Piney River. This survey was requested to ascertain if Piney River is presently receiving any acid wastes from the mine tailings site.

The following table lists the stations depicted on the attached map which were sampled during this survey.

Station No.	Stream	Station Location
1	Piney River	Above all past mining activity
2	Piney River	Route 151 Bridge
3	Piney River	Route 674 Bridge at Roses Mill
4	Tye River	Route 56-158 Bridge
5	Tye River	Route 29 Bridge
6	Tye River	Above confluence with Jones Creek
7	Tye River	Route 654 Bridge
8	Tye River	Route 626 Bridge

Continued Page 2...

ORIGINAL
(Red)

The survey was performed by C. L. Auckerman on 14 July 1975. Due to high water during this survey, it was repeated on 11 August 1975. The results of both surveys are listed in the following table:

Station No.	July 14 Survey pH	July 14 Survey Flow	August 11 Survey pH	August 11 Survey Flow
1			7.1	
2	6.8	155 cfs	8.0	74 cfs
3	6.0		6.8	
4	6.7	597 cfs	7.3	175 cfs
5	6.5		7.0	
6	6.5		7.0	
7	6.5		7.0	
8	6.5		7.1	

The survey results do not show an acid leachate addition to the Piney River as it flows past the former mining sites. During the surveys, the flows were much higher than drought flows; however, this fact is minimized since pH is a logarithmic function whereas dilution is a linear function. In addition, little if any leachate would be expected during drought conditions. It is felt that, if a problem exists, the survey would have detected a pH change. Flow data for the gaging stations follow:

Station 2

10 year, 7 day drought flow		- 5.2 cfs
July 14, 1975		- 155 cfs
August 11, 1975		- 74 cfs
Water Year 1973	Max	- 2030 cfs
	Mean	- 173 cfs
	Min	- 4.1 cfs

Station 4

10 year, 7 day drought flow		- 7 cfs
July 14, 1975		- 597 cfs
August 11, 1975		- 175 cfs
Water Year 1973	Max	- 2030 cfs
	Mean	- 280 cfs
	Min	- 22 cfs

A Hach color comparator was used in the survey pH determinations.

By request of DAT, samples were taken at all stations on the 11 August 1975 survey for total hardness, sulfate and calcium analyses. These results will not be available until mid-September and are not included in this report since this report must be completed prior to the 21-22 August 1975 Board meeting. The conclusions are to be used in response to the 305(b) reference of acidic leachate discharge to the Piney River and which will be included in a report to the Board.

RFT:jw

Attachment

100047

MEMORANDUM

ORIGINAL
(Red)

State Water Control Board

2111 North Hamilton Street P. O. Box 11143 Richmond, VA.

SUBJECT: Piney River Survey - Special Studies 2-11 76

TO: C. L. Auckerman

FROM: R. F. Tesh RFTesh

DATE: 8 July 1975

COPIES: J. A. Preston - DAT
C. A. Shepherd- Charlottesville
A. L. Willett - BSFS
VRO File

The purpose of this survey is to determine the extent of the effect to the receiving stream of the alleged mine tailing pond leachate from the S. Vance Wilkins property (formerly known as American Cyanamid at Piney River). The leachate is reported to have been stopped and the survey is requested to substantiate the report.

The survey should consist of pH measurements and metals samples at the following stations: In addition, flow measurements are to be taken at the gaging stations located at 2) and 4) below.

1) Piney River - above all past mining activity (Rt. 778 bridge)
2) Piney River - Rt. 151 Bridge
3) Piney River - Rt. 674 bridge at Roses Mill
4) Tye River - Rt. 56-158 Bridge
5) Tye River - Rt. 29 Bridge TYE 13.75
6) Tye River - above confluence with Jones Creek (adjacent to Rt. 622)
7) Tye River - Rt. 654 Bridge
8) Tye River - Rt. 626 Bridge TYE 0.30

The above stations, gaging stations excepted, are suggested and the sampling points may be picked in the field.

Station location on topo maps are to be forwarded to DCLS and attached to the appropriate lab sheet.

The pH and flow measurements are to be sent to me upon your completion of the field work.

Coordination with the Surface Water Investigations Office will be necessary to obtain the flow readings.

Coordination with BSFS will be necessary regarding the shipment of samples since this survey has not been scheduled with DCLS.

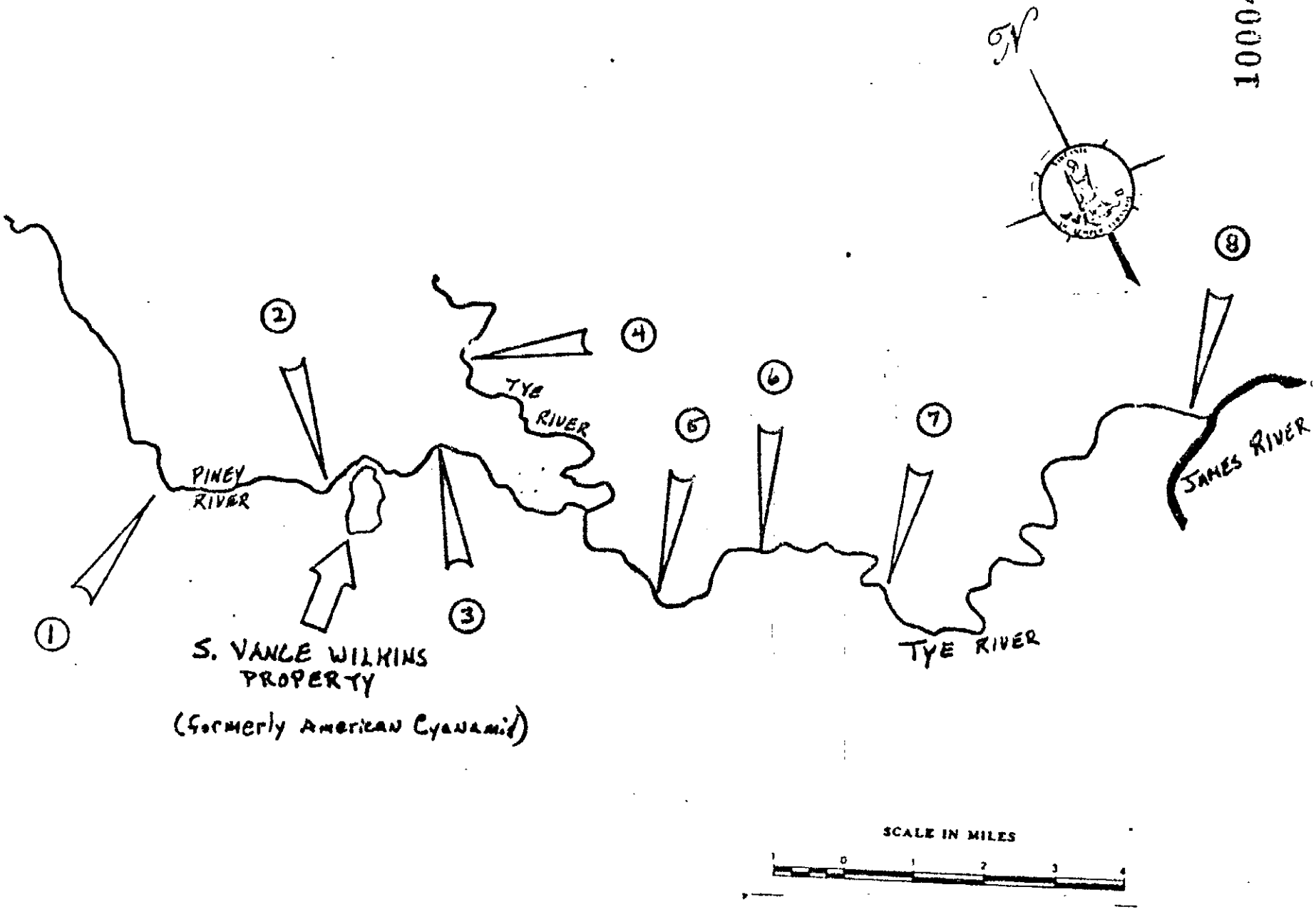
The writer assumes responsibility for writing the final report.

RFT:jw

100048

ORIGINAL
(Red)

100049



Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

#1

ORIGINAL
(Red)

one quart jar

FIELD AND LABORATORY DATA

LG CD ADP

MON FK SS PC BM PS BIO GW: X

LATITUDE

FK, SS, PC, PS, BM, OR BIO NO.: 7 8 - 0 3 8

LONGITUDE

BASIN | STREAM | RIVER MILE

LABORATORY NUMBER | DEPTH | SECTION | REGION

MONTH: 0 8 | DAY: 1 9 | YEAR: 7 7 | TIME: 2 2 3 0 | SOURCE

TIDE | % FLB | FLOW CFS | WEATHER | TEMP. °F

DISSOLVED OXYGEN | DO% SAT | FIELD pH

Collect for: D.E.S.-R.Gregory

Collected by: C.L.E.A.N., Inc.

Name of Stream: Piney River

Station Description: U.S. Titanium plant, 100 yds. Above discharge pipe

018124 AUG 22 77 VA. DCLS ENVIS

PARAMETER	STATE CODE	VALUE		PARAMETER	STATE CODE	VALUE
Coliform, Total /100 ml	020			Arsenic	058	
Coliform, Fecal /100 ml	055			Cadmium	078	
pH (Laboratory)	050	5.1		Calcium	052	
~~Alkalinity~~ Acidity	022	18		Chromium	040	
Total Solids, Total	024			Copper	045	
Volatile	025		X	Iron 1.7	044	1.7
Fixed	026			Lead	043	
Suspended Solids, Total	027			Magnesium	246	
Volatile	028			Manganese	096	
Fixed	029			Mercury	080	
Dissolved Solids Total	067			Zinc	041	
Chloride	033					
Hardness	032	23				
Nitrogen, Total Kjeldahl	035					
Phosphorus, Total	065					
Phosphorus, Ortho	064					
Ammonia mg/l as N	036			Turbidity	049	
Nitrite mg/L as N	037			Pesticides	121, 122	
Nitrate mg/L as N	038			Settleable Solids	023	
Sulphate	107	37		Conductivity	034	
Hexane Extractables	048					
BODs	019					
COD	051					

Date released from Lab: SEP 19 1977

Chemist: S. R. Pitts, Jr

100050

Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

two quart jars

FIELD AND LABORATORY DATA

#2

ORIGINAL (Red)

LG CD ADP

MON FK BS PC BM PS BIO GW: X

LATITUDE

FK, SS, PC, PS, BM, OR BIO NO.: 7 8 - 0 3 8

LONGITUDE

BASIN | STREAM | RIVER MILE

LABORATORY NUMBER | DEPTH | SECTION | REGION

MONTH: 0 8 | DAY: 1 9 | YEAR: 7 7 | TIME: 2 2 4 5 | SOURCE

TIDE | % FLB | FLOW CFS | WEATHER | TEMP. °F

DISSOLVED OXYGEN | DO% SAT | FIELD pH

Collect for: D.E.S. - R. Gregor

Collected by: C.L.E.A.N., Inc.

Name of Stream: Piney R.

Station Description: U.S. Titanium plant, sample taken from discharge pipe

VA. DCLS ENV. SCI.
0118125 AUG 22 77

PARAMETER	STATE CODE	VALUE		PARAMETER	STATE CODE	VALUE
Coliform, Total /100 ml	020			Arsenic	058	
Coliform, Fecal /100 ml	055			Cadmium	078	
pH (Laboratory)	050	2.5		Calcium	052	
Alkalinity	022	22,100		Chromium	040	
Total Solids, Total	024			Copper	045	
Volatile	025		X	Iron	044	1,100
Fixed	026			Lead	043	
Suspended Solids, Total	027			Magnesium	246	
Volatile	028			Manganese	096	
Fixed	029			Mercury	080	
Dissolved Solids Total	067			Zinc	041	
Chloride	033					
Hardness	032	600				
Nitrogen, Total Kjeldahl	035					
Phosphorus, Total	065					
Phosphorus, Ortho	064					
Ammonia mg/l as N	036			Turbidity	049	
Nitrite mg/L as N	037			Pesticides	121, 122	
Nitrate mg/L as N	038	7		Settleable Solids	023	
Sulphate	107	7600		Conductivity	034	
Hexane Extractables	048					
BODs	019					
COD	051					

SEP 19 1977 RECEIVED VFS

Date released from Lab: SEP 19 1977 Chemist: S. R. Pitts Jr

100051

Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

ORIGINAL (Red)

#3

two quart jars

FIELD AND LABORATORY DATA

LG	CD	ADP

MON	FK	SS	PC	BM	PS	BIO	GW
	X						

LATITUDE:

LONGITUDE:

FK, SS, PC, PS, BM, OR BIO NO.: 786038

Collect for: D.E.S.-R. Gregory

Collected by: CLEAN, Inc.

Name of Stream: Piney R.

Station Description: U.S. Titanium plant, sample taken 100 yds. below discharge pipe

BASIN: STREAM: RIVER MILE:

LABORATORY NUMBER: DEPTH: SECTION: REGION:

MONTH	DAY	YEAR	TIME	SOURCE
08	19	77	2300	

TIDE: % FLB: FLOW CFS: WEATHER: TEMP. °F:

DISSOLVED OXYGEN: DO% SAT: FIELD pH:

VA. DCLS ENV. SCI. 018126 AUG 22 77

PARAMETER	STATE CODE	VALUE	PARAMETER	STATE CODE	VALUE
Coliform, Total /100 ml	020		Arsenic	058	
Coliform, Fecal /100 ml	055		Cadmium	078	
pH (Laboratory)	050	2.7	Calcium	052	
Alkalinity	022	13,800	Chromium	040	
Total Solids, Total	024		Copper	045	
Volatile	025		Iron	044	7.0
Fixed	026		Lead	043	
Suspended Solids, Total	027		Magnesium	246	
Volatile	028		Manganese	096	
Fixed	029		Mercury	080	
Dissolved Solids Total	067		Zinc	041	
Chloride	033				
Hardness	032	90			
Nitrogen, Total Kjeldahl	035				
Phosphorus, Total	065				
Phosphorus, Ortho	064				
Ammonia mg/l as N	036		Turbidity	049	
Nitrite mg/L as N	037		Pesticides	121, 122	
Nitrate mg/L as N	038		Settleable Solids	023	
Sulphate	107	700	Conductivity	034	
Hexane Extractables	048				
BOD5	019				
COD	051				

RECEIVED FS

Date released from Lab: SEP 19 1977 Chemist: S. R. Pettz, Jr.

100052

Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

ORIGINAL (Red)

FIELD AND LABORATORY DATA

one quart jar

#4

MON	FK	BS	PC	BM	PS	BIO	GW
	X						

CD ADP

LATITUDE:

LONGITUDE:

FK, SS, PC, PS, BM, OR BIO NO.: 77-038

Collect for: D.E.S. - R. Gregory

Collected by: G.G.E.K.W., Inc.

Name of Stream: Tye R.

Station Description: at Rt. 29 bridge dam

BASIN: STREAM: RIVER MILE:

LABORATORY NUMBER: DEPTH: SECTION: REGION:

MONTH DAY YEAR: 08 19 77 TIME: 2000 SOURCE:

TIDE: % FLB: FLOW CFS: WEATHER: TEMP. °F:

DISSOLVED OXYGEN: DO% SAT: FIELD pH:

VA. DCLS ENV. SC. 018127 AUG 22 77

PARAMETER	STATE CODE	VALUE		PARAMETER	STATE CODE	VALUE
Coliform, Total /100 ml	020			Arsenic	058	
Coliform, Fecal /100 ml	055			Cadmium	078	
pH (Laboratory)	050	6.9		Calcium	052	
Alkalinity	022	11		Chromium	040	
Total Solids, Total	024			Copper	045	
Volatile	025		X	Iron	044	0.3
Fixed	026			Lead	043	
Suspended Solids, Total	027			Magnesium	246	
Volatile	028			Manganese	096	
Fixed	029			Mercury	080	
Dissolved Solids Total	067			Zinc	041	
Chloride	033					
Hardness	032	40				
Nitrogen, Total Kjeldahl	035					
Phosphorus, Total	065					
Phosphorus, Ortho	064					
Ammonia mg/l as N	036			Turbidity	049	
Nitrite mg/L as N	037			Pesticides	121, 122	
Nitrate mg/L as N	038			Settleable Solids	023	
Sulphate	107	19		Conductivity	034	
Hexane Extractables	048					
BOD5	019					
COD	051					

SEP 1977 RECEIVED ES

Date released from Lab: SEP 19 1977 Chemist: S. R. Pitts, Jr.

100053

Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

ORIGINAL
(Red)

Dequantjer

FIELD AND LABORATORY DATA

#5

LG CD ADP

MON FK BS PC BM PS BIO GW: X

LATITUDE

FK, SS, PC, PS, BM, OR BIO NO.: 77-038

LONGITUDE

BASIN | STREAM | RIVER MILE

LABORATORY NUMBER | DEPTH | SECTION | REGION

MONTH: 08 | DAY: 17 | YEAR: 77 | TIME: 2000 | SOURCE

TIDE | % FLB | FLOW CFS | WEATHER | TEMP. °F

DISSOLVED OXYGEN | DO% SAT | FIELD pH

Collect for: D.E.S-R.Gregory

Collected by: CLEAN, Inc.

Name of Stream: Tye R.

Station Description: at 10ft. hole 2mi. below Tye R. post office

VA. DCLS ENV. SCI
81128 AUG 22 77

PARAMETER	STATE CODE	VALUE		PARAMETER	STATE CODE	VALUE
Coliform, Total /100 ml	020			Arsenic	058	
Coliform, Fecal /100 ml	055			Cadmium	078	
pH (Laboratory)	050	6.3		Calcium	052	
Alkalinity	022	8		Chromium	040	
Total Solids, Total	024			Copper	045	
Volatile	025		X	Iron	044	0.6
Fixed	026			Lead	043	
Suspended Solids, Total	027			Magnesium	246	
Volatile	028			Manganese	096	
Fixed	029			Mercury	080	
Dissolved Solids Total	067			Zinc	041	
Chloride	033					
Hardness	032	58				
Nitrogen, Total Kjeldahl	035					
Phosphorus, Total	065					
Phosphorus, Ortho	064					
Ammonia mg/l as N	036			Turbidity	049	
Nitrite mg/L as N	037			Pesticides	121, 122	
Nitrate mg/L as N	038			Settleable Solids	023	
Sulphate	107	20		Conductivity	034	
Hexane Extractables	048					
BOD5	019					
COD	051					

RECEIVED DCLS SEP 1 7

Date released from Lab: SEP 13 1977 Chemist: S. R. Pettaway Jr. 100054

FISH KILL # 78-011, PC 78-028
STREAM Piney R., Tye R.
BASIN James
CITY/COUNTY Nelson/Amherst Co.

ORIGINAL (Red)

SUMMARY: Following a thunderstorm on the night of 10-11 July 1977 a lagoon on the property of U.S. Titanium Co. overflowed its berm, spilling acidic wastes into the Piney River. As a result, 73,056 fish were killed in the Piney River and in the Tye River below its confluence with the Piney. At least thirteen species of fish were represented in the kill count which extended over 11.5 river miles. The lagoon that failed was part of a no-discharge system intended to prevent run-off from copperas ($FeSO_4$) piles on U.S. Titanium property from reaching the Piney River. U.S. Titanium holds a no-discharge certificate, which was apparently violated by flows from the plant which occurred on 11 and 12 July 1977. Field and laboratory chemical tests conducted in connection with the fish kill investigation indicated that these discharges caused the state water quality standard for pH to be violated. Replacement cost of fish was $7,047.03. Cost of investigation was $2193.42. Total cost to State of Virginia was $9,240.70.

CONCLUSIONS: Acid wastes spilled from a lagoon on U.S. Titanium property in Nelson Co. adjacent to the Piney River lowered the pH in the receiving stream, causing a major fish kill in the Piney-Tye River system below the plant.

THE INVESTIGATION

1.0 REPORTED INFORMATION:

A kill was in progress in the Tye River, which began on the morning of 11 July 1977. The river was cloudy and reddish at the Rt. 739 bridge.

Reported by: Game Warden G. Brantley Date 11 July 1977 Time 1345
Report received by: Larry Simmons Date 11 July 1977
Investigated by: L. Simmons, R. Bodkin Date 11 July 1977
Investigated by: There were 10 SWCB Date
Investigated by: investigators in all. Date 12-13 July 1977 (see Section 2.0)
Final Report Edited by: R. Gregory

CHAIN OF NOTIFICATION (list of names in order of contact)

(1) Enforcement Division J. Hensley (date) 12 July (time)
(2) Regional Representative L. Simmons, R. Tesh (VRO) (date) 11 July (time) 1345
(3) Game Warden (CGIF) Gary Brantley (date) 11 July (time)
(4) (name) Nelson Co. Administrator's office (date) 12 July (time) 0940
(5) (name) R. Puckett office of Commerce & Resources (date) 12 July (time) 1120

DATE FISH KILL OCCURRED (as determined by investigation) 11 July 1977
DATE FISH KILL ENDED 11 July 1977

100055

Fish Kill No. 78-01

ORIGINAL
(Red)

Weather Previous to Kill thunderstorms
Weather During Kill partly cloudy, thunderstorms
Weather Following Kill same (see weather data in Section 2.0)
(If rain - include amount)

WITNESSES:		
	name	Gary Brantley / Woody Greenberg
	address	Box 250D, Faber, Va. 22938 /
	phone	804-263-4012 / 804-263-4873
	position	game warden / Public Projects Tech., Nelson Co.

Ron Woods	Other Area Residents:
William Smith	Earl Bryant (804-263-5547)
804-263-4242	John S. Carter (804-9462316)
Nelson Co. Deputy Sheriffs	William D. Wright (804-263-4628)

2.0 INVESTIGATORS DISCUSSION:

On the morning of 11 July 1977, Game Warden Gary Brantley received notification that a fish kill was in progress on the Tye River in the vicinity of the Rt. 739 bridge (Station 7) near the town of Tye River. The kill was reported by Mr. William D. Wright, who noted that the river was colored red at the point when he first arrived on the scene around 0630 hours. The color had dispersed by 1100 hours.

Warden Brantley, accompanied by Nelson Co. Deputy Sheriff William Smith arrived at the Rt. 739 bridge around 1200 hours. They collected two water samples and samples of dying fish at this point, and notified the State Water Control Board's Valley Regional Office at approximately 1345 hours through the Nelson Co. Sheriff's Dept. Game Warden Brantley, now accompanied by Deputy Sheriff Ron Woods, continued to trace the kill upstream, arriving at U.S. Titanium's property near the town of Piney River at 1500 hours, where they discovered a pipe (Station 3) discharging to the Piney River. A sample of the discharge was collected. This sample and the samples collected earlier were taken to the Nelson Co. Sheriff's Dept. and refrigerated.

State Water Control Board investigators Roderick Bodkin and Larry Simmons arrived at the Rt. 739 bridge (Station 7) at 1600 hours and found many dead and dying fish. Several fish in distress were collected. Field tests were performed, and the pH was found to be 6.2 (comparator method was used on all field pH tests during this investigation). A backwash area under the bridge was discovered (Station 8) where the field pH was 5.2. The majority of the fish were dead by this time, but the behaviour of a few dying fish was noted. Many were listless, lying on their sides in pool areas with feeble opercular movements. Some were drifting with no apparent control in flowing waters. These fish died almost instantly upon being handled. Significantly, a few fish in slightly better shape were observed. These were attempting to bury their heads in the stream bottom and/or rubbing their bodies against the rocky substrate, indicating that they were being (or had been) exposed to an irritating substance.

Simmons and Bodkin traced the kill upstream, stopping first at the Rt. 56-158 bridge over the Tye River above its confluence with the Piney. Several large schools of live minnows were observed and no dead fish were found. Stopping next at the Rt. 674 bridge over the Piney River at Roses Mill (Station 6) they found hundreds of dead minnows, and no live fish were seen. Field tests were performed and the pH of the stream at this point was 6.2. The investigators proceeded to the abandoned American Cyanamid plant (property owned by U.S. Titanium subsequent to March 1976) at the

2.0 INVESTIGATORS DISCUSSION:

ORIGINAL (Red)

town of Piney River. Although the investigators did not enter the plant property at this time, they did observe live, healthy, fish and found no dead fish at the Rt. 151 bridge (Station 1) above the plant.

To determine the downstream extent of the kill, the investigators followed the Tye River via Rt. 662 eastward from the Town of Tye River, and checked further downstream at the Rt. 654 bridge. From these observations, they concluded that the kill ended just upstream of the Rt. 654 bridge (at lower extent of kill on map).

The investigators met Game Warden Brantley and Deputy Sheriff Woods at the Nelson Co. Sheriff's Dept. at 1915 hours. Brantley and Woods informed the SWCB team of the discharge they had found at U.S. Titanium and turned over the fish and samples they had collected. The water samples were returned to the Bridgewater Office by the investigators and delivered to the Dept. of Consolidated Laboratory Services (DCLS) by James Preston of VRO. The fish samples were transported from VRO to DES by David Chance of DES.

These samples proved very crucial to the investigation. Mr. Bodkin measured a pH of 4.2 on one of the two duplicate water samples collected by Warden Brantley at the Rt. 739 bridge (Station 6). The pH of both of these samples as measured by DCLS was 4.8. The pH of the discharge sample (Station 3) as measured with the field test kit was 4.7; the laboratory pH of the Game Warden's discharge sample was 2.5. [In a later discussion it will be shown that these pH values are sufficiently acidic to kill fish on short-term exposure].

The moribund fish collected on the first day of the investigation were also refrigerated and shipped to Richmond on ice, where they were frozen and stored for a short time before undergoing pathological examination. The largest fish collected and examined, a 14 inch sucker, exhibited gill damage that could be attributed to exposure to an acidic or a caustic substance, and a brownish coating was found on the gill tissue which would have restricted respiration. Although the gills of the smaller fish had deteriorated too much to allow meaningful pathological examination, these gills were also coated with the brownish mucus (see pathology reports for details).

Because of the length and magnitude of the kill, and because VRO personnel were involved in the simultaneous investigation of another large kill, assistance from the central office was requested on the evening of the 11th. Arrangements were made for a rendezvous of VRO and Richmond personnel at the Nelson Co. Sheriffs' office on the morning of 12 July. The following personnel from Richmond were involved in the second day of the investigation: Ron Gregory, John Roland, Mark Stedfeld and Dennis Testerman. Assisting from VRO were Chuck Auckerman and Tom Mizell. Mizell, accompanied by Warden Brantley, conducted an extensive investigation of the U.S. Titanium property, while the rest of the SWCB staff began the fish count.

The U.S. Titanium Co. holds a no-discharge certificate. The main problem at U.S. Titanium is acidic runoff from several acres of copperas waste piles (chemical name, ferrous sulfate; formula $FeSO_4$) left by American Cyanamid which ceased operations at the site in 1971. The copperas wastes were a byproduct of their titanium ore refinement process. To control the copperas runoff problem, a two-lagoon system has been installed. The design of the system is thus (see figure 1): the smaller lower lagoon acts as a catchbasin for the runoff for the copperas piles; runoff collected in this lagoon is pumped uphill to a larger lagoon which serves as an evaporation pond. The two lagoons operating in concert are intended to prevent acid runoff from reaching the Piney River adjacent to the plant.

2.0 INVESTIGATORS DISCUSSION:

ORIGINAL
(Red)

Tom Mizell's inspection on 12 July clearly showed that the system had failed. The lower lagoon was observed overflowing its berm in two locations and acid wastes were reaching the Piney River via ditches across the U.S. Titanium property.

Cause for this failure appeared to stem from sporadic maintenance of the facility, which allowed sections of the berm to deteriorate, and the accumulation of silt in the lower lagoon which reduced its runoff holding capacity. The fact that the pump must be manually-operated, and is not automatically triggered by a rise in lagoon level may have contributed to the overflow. There is also a possibility that the lower lagoon had not been pumped out recently, which would have reduced its holding capacity in the event of a storm. Mizell also found that the pumps leaked acid wastes, which found their way via ditches to the Piney. In addition, an erosion ditch was found that would allow some of the runoff from the copperas piles to circumvent the lower lagoon and go directly to the Piney.

After completing this inspection and taking several slides, Mizell rejoined the rest of the SWCB staff conducting the fish kill count.

The first dead fish were found by J.V. Roland a few yards below the discharge pipe at U.S. Titanium. Following SWCB's Standard fish kill counting procedure, the first hundred yard count was made here; fifteen additional hundred-yard counts were made at 0.5 mile intervals over a distance of 7.5 stream miles on the 12th. Approaching darkness forced a halt to the counting procedure on the 12th, so another team, consisting of Ron Gregory and Terry Scalabrin from Richmond, and Larry Carpenter from VRO, continued the count on the 13th. An additional eight 100-yard segments were counted on the 13th., for a total of 24 segments covering 11.5 stream miles. [The count in segment 24 indicated that more dead fish were to be found below this point, but for several reasons the count was not extended into a third day.]

The count-estimate gave a projected total of 73,056 fish, representing at least 13 species, for the area counted. About 92% of the total were non-game fish, mainly minnows (*Cyprinidae*). The remaining 8% were game fish, the majority of which were young smallmouth bass.

Additional field tests and observations were made by the fish kill counting team on the 12th. and 13th. On the 12 th., John Roland found that the field pH in the Piney River just above the U.S. Titanium discharge pipe (station 2) was 6.5; the pH in the pool below this pipe (station 4) was lower than the 4.0 lower range of the field test kit; the field pH in the plume of the discharge (station 5) was 4.2. A sample of the discharge (station 3) was collected by R. Gregory on the 12th. and analyzed by DCLS for metals and sulfates. Trace amounts of chromium (0.10 mg/l) copper (0.40 mg/l) and zinc (0.20 mg/l) were found in this sample, along with 1,500 mg/l iron and 5,000 mg/l sulfates. The sulfate content of the effluent sample collected on the previous day by Game Warden Brantley was 5,600 mg/l.

The discharge at U.S. Titanium was observed on 11 July 1977 by Warden Brantley and Deputy Sheriff Woods, and on the 12th. by all members of the SWCB investigation team as well as Warden Brantley. The discharge was observed to have stopped when the SWCB fish counting team visited the site on the 13th. Responding to a request from VRO for additional samples upstream of the discharge, Ron Gregory collected a sample at the Rt. 151 bridge (Station 1) and at Station 2, just above the U.S. Titanium discharge. The field pH of the two samples was 8.7 and 6.3 respectively, while the laboratory pH values were 7.5 and 5.9. This drop in pH between the two stations above the U.S. Titanium discharge precipitated a search for an additional acid waste source between these two stations, and one was subsequently discovered. The source (located by Ted Jett of VRO) was an old tailings pond adjacent to the

ORIGINAL
(Red)

Date	Flow, cfs
7/9/77	10
7/10/77	14
7/11/77	23
7/12/77	20
7/13/77	25

The sharp rise in flow between the 10th. and 11th. indicates the magnitude of the thunderstorm activity in the Piney River watershed during the night that the kill began.

2.0 INVESTIGATORS DISCUSSION:

Piney River, which was filled with a grey material (unlike the red-orange copperas). An erosion ditch drained run-off from this pond to the Piney River, and water found in pools along this ditch was quite acid, but clear, unlike the dark red acid water runoff from the copperas piles.

SWCB Water Quality Standard Violations

This section of the Piney River lies in Section 11 of the Upper James Basin and falls in the major water class III A. The lower pH standard for this classification is 6.0; any pH values lower than this may constitute stream standard violations. That the pH of the discharge from the U.S. Titanium property on 11 and 12 July 1977 was well below 6.0 is evident from both the field and laboratory tests reported earlier. The sample collected by Game Warden Brantley on 11 July 1977 at the Rt. 737 bridge (Station 7), which is 12 km below the discharge, indicated that the stream pH on this date was below the minimum pH standard. John Roland's measurement of a pH of 4.2 in the Piney River just below the discharge, in the plume after some mixing, indicated that the discharge may have violated stream pH standards on 12 July also.

Weather and Flow Data

According to local residents there were locally heavy thundershowers during the night hours of 10-11 July 1977. One area resident estimated this rainfall at 3/4 of an inch. NOAA at Byrd Field in Richmond referred our request for precipitation data to the National Climate Center in Ashville, N.C. We were informed that while there was at least one, and possibly more, weather stations in Nelson County, data from these stations for the time period in question would not be available until after September 20. We were provided with the following data from the nearest "first order" weather station in Lynchburg, Va., which is approximately 22 miles to the south of the kill area:

Date	Precipitation (inches)
7/9/77	0
7/10/77	0.01
7/11/77	0.18
7/12/77	0.03

A heavy thundershower passed through the area on the afternoon of the 12th. while the count and investigation was underway. It is interesting to note that a rain gauge operated by Deputy Sheriff Wood near Piney River measured 0.6 inches of rain from this event, while the Lynchburg station recorded only 0.03 inches on the 12th.

The flow data for a gauging station located on the Piney River is reflective of local weather events. The following flow data for the gauging station located on the Piney River at the Rt. 151 bridge upstream of the U.S. Titanium property was obtained from Jack Easton, Engineer in charge, SWCB Surface Water Investigation, Charlottesville, Va.:

Fish Kill No. 78-011

ORIGINAL
(Red)

2.1 STATION DESCRIPTION:

1. Piney R., rt. 151 bridge, upstream of U.S. Titanium property.
2. Piney R., U.S.Titanium property, 3 meters upstream of discharge pipe.
3. U.S. Titanium discharge.
4. Pool below U.S. Titanium discharge pipe.
5. Piney R.,U.S. Titanium property, 5 meters below discharge pipe in discharge plume.
6. Piney River, at rt. 674 bridge, Rose Mill, approx. 2.4 km. below U.S. Titanium discharge pipe.
7. Tye R., rt. 739 bridge, Tye River post office, approx. 12 km. below U.S. Titanium discharge pipe.
8. Tye R., backwater pool beneath rt. 737 bridge.
9.
10.

2.2 PICTURES TAKEN: (identify pictures: slides (s)* or prints (p))

Location:

1. _____ 6. _____
2. _____ 7. _____
3. _____ 8. _____
4. _____ 9. _____
5. _____ 10. _____

* See attached list. All slides were taken by Tom Mizell, V.R.O. on 12 July 1977. His map following the list shows the locations where some of the slides were taken.

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ORIGINAL
(Red)

2.2 Pictures Taken

Slide No.	Description
1	Pool below discharge pipe at U.S. Titanium. Note red color. (Station 4).
2	Discharge pipe at U. S. Titanium (Station 3) and pool below pipe (Station 4).
3	Flow from pool below below discharge pipe at U.S. Titanium entering Piney River. Note reddish plume.
4	Ditch beside railroad track carrying flow to pipe from lower lagoon. Note old tailings pond to right of picture.
5	Same as 4.
6	Ditch running downhill from lower lagoon, looking up from bottom of hill.
7	Pool on south side of track containing acid water. Pool is connected via a pipe running under track to ditch on north side.
8	Ditch carrying leakage from pump house, at bottom of hill.
9	Ditch carrying leakage from pumphouse. Looking uphill toward pumphouse.
10	Same as 9.
11	Pipe just below lower lagoon. Note red water and foam in ditch.
12	Lower wastewater holding pond.
13	Emergency spillway of lower wastewater holding pond. Pond is to the right. Note red water in ditch to left of berm. White material is lime applied after investigation was underway.
14	Similar view to 13.
15	Similar view to 13 and 14.
16	Another view of berm. Lagoon is to the left. Note shovel and fresh dirt on berm in center of picture, and red water in ditch to right of berm. Flow in this ditch moves toward the viewer and through the pipe shown in slide 11, then downhill towards the river.
17	View of lower wastewater holding pond, with copperas pile in left background.

ORIGINAL
(Red)

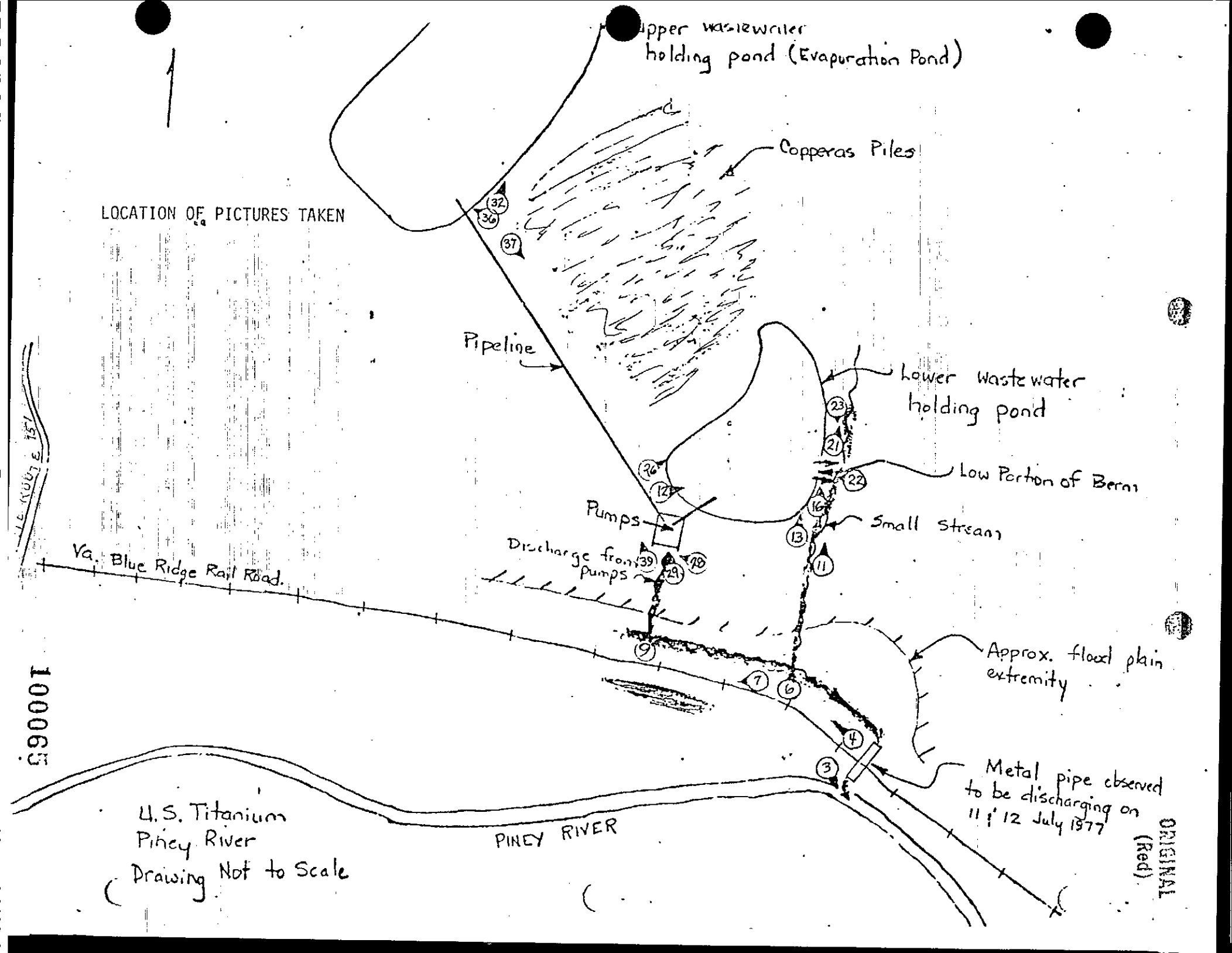
2.2 Pictures taken (continued).

Slide No.	Description
18	Similar view to slide 16.
19	Similar view to slides 16 and 18.
20	Ditch beside berm of lower wastewater holding pond, showing red water.
21	Similar view to slides 16, 18, and 19.
22	Close-up view of fresh dirt on low portion of lower wastewater holding pond berm, near shovel shown in slides 16, 18, and 19.
23	Looking downhill along ditch beside lower lagoon berm. Pipe shown in slide 11 is just visible in left background.
24	Red water in ditch beside lower lagoon.
25	View similar to slide 24.
26	Looking across lower lagoon, from base of copperas piles. Emergency spillway is in upper right corner.
27	Similar view to slide 26.
28	Pumphouse, showing leakage from pumps inside.
29	Pump for pumping water from lower wastewater holding lagoon to upper wastewater holding lagoon. Note leakage on floor of pumphouse.
30	Similar view to slide 29.
31	Workman adding dirt to low portion of berm of lower wastewater holding lagoon.
32	Upper wastewater holding lagoon, or evaporation pond. Note low level of water.
33	Similar view to slide 32.
34	Another view of upper wastewater holding pond.
35	Outfall of pumping system into upper lagoon.
36	Same as slide 35.
37	Pipeline carrying water from lower to upper lagoon, and erosion ditches.

ORIGINAL
(Red)

2.2 Pictures taken (continued).

Slide No.	Description
38	Dead fish in Tye River downstream of Rt. 29 bridge.
39	Copperas piles.
40	Pollen lines on dead trees in lower lagoon show that pumping during the day of 12 July 1977 had lowered lagoon level a few inches.


1
Upper wastewater holding pond (Evapuration Pond)
Copperas Piles
LOCATION OF PICTURES TAKEN
Pipeline
Lower Wastewater holding pond
Low Portion of Berm
Small Stream
Pumps
Discharge from Pumps
Va. Blue Ridge Rail Road.
Approx. flood plain extremity
Metal pipe observed to be discharging on 11 & 12 July 1977
U.S. Titanium
Piney River
Drawing Not to Scale
PINEY RIVER
ORIGINAL (Red)
100065

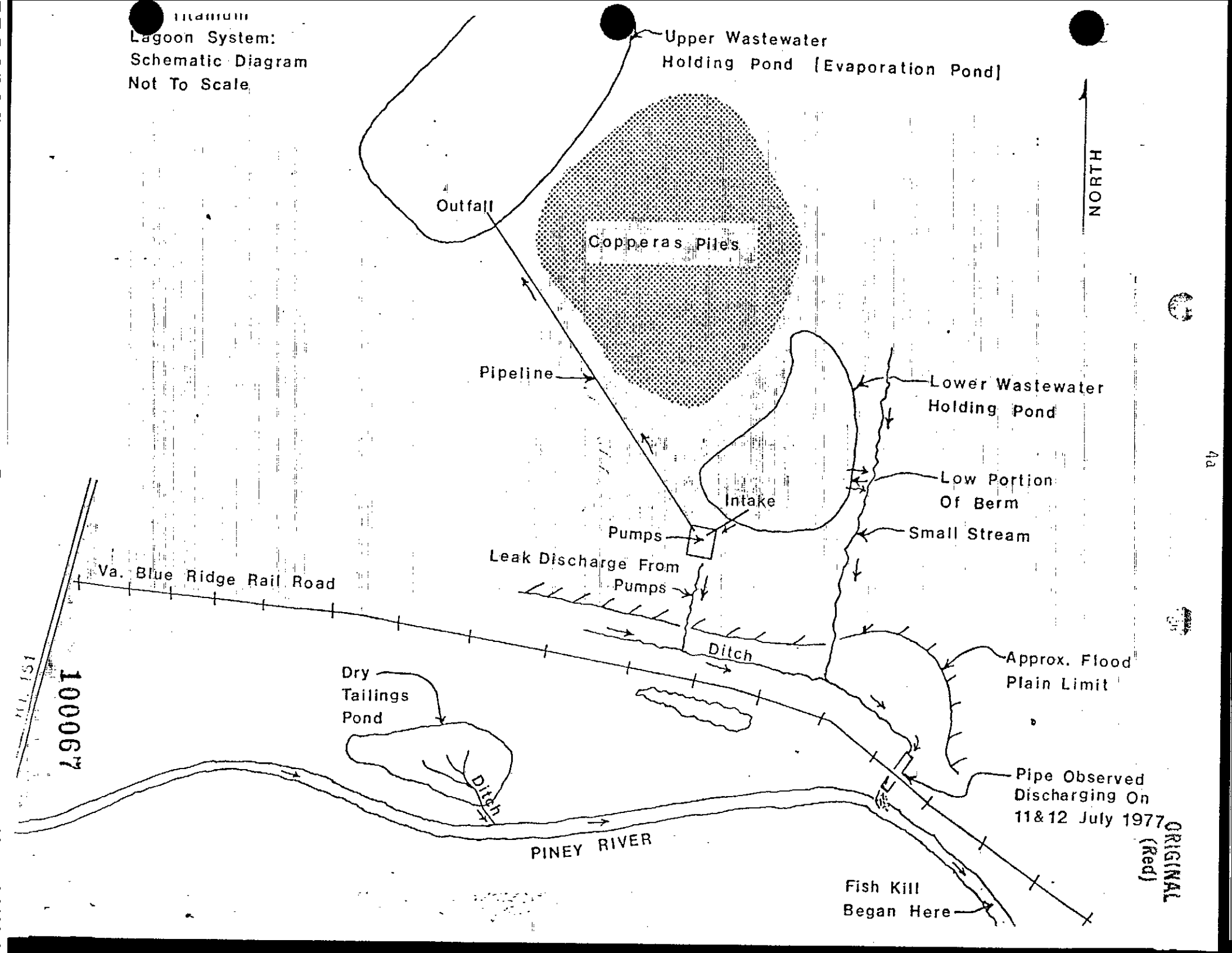
Fish Kill No. 78-01

ORIGINAL
(Red)

3.0 MAP OF AREA: Include company layout, discharges in area, exact extent of kill, extent of visual stream degradation.

SEE MAPS ATTACHED

100066


Titanium
Lagoon System:
Schematic Diagram
Not To Scale
Upper Wastewater
Holding Pond [Evaporation Pond]
NORTH
Outfall
Copperas Piles
Pipeline
Lower Wastewater
Holding Pond
Low Portion
Of Berm
Intake
Pumps
Small Stream
Leak Discharge From
Pumps
Va. Blue Ridge Rail Road
Ditch
Approx. Flood
Plain Limit
Dry
Tailings
Pond
Ditch
Pipe Observed
Discharging On
11&12 July 1977
PINEY RIVER
Fish Kill
Began Here
ORIGINAL
(Red)
100067
4a

ORIGINAL
(Red)

FISH KILL 78-011
PINEY R. - TYE R.
NELSON CO. - AMHERST CO.
JULY 1977

100068

Fish Kill No. 78-011

ORIGINAL
(Red)

4.0 VISUAL OBSERVATIONS:

4.1 WATER:

Station	D.O. mg/l	pH	Temp. (°F)	Dead Fish ?	Color	Turbidity
1		8.7		none	clear greenish	slightly turbid
2		6.3 6.5		none	"	slightly turbid
3		4.7		NA	red	moderately turbid
4		<4.0		NA	dark red	moderately turbid
5		4.2		several minnows	reddish	slightly turbid
6	7.9	6.2		many fish	clear	slightly turbid
7	7.9	6.2		many fish	"	slightly turbid
8	7.9	5.2		many fish	"	slightly turbid
9						
10						

Station	Floating Solids	Surface Film	Flow	Tide Stage	Odor (def)	Other
1	-	none	*	NA	none	
2	-	-		"	"	
3	-	-		"	"	
4	-	-		"	"	
5	-	-		"	"	
6	-	-		"	"	
7	-	-		"	"	
8	-	-		"	"	
9						
10						

*See Weather and Flow Data Section in 2.0 Investigators Discussion.

100069

Fish Kill No. 78-011

ORIGINAL
(Red)

4.2 FISH:

GENERAL APPEARANCE:

nervous, scary	spiraling
sinking to bottom	flashing
gasping at surface	rubbing against bottom several
unusual color	able to avoid capture few
frantic	floating listlessly some
slugish most	swimming upside down
	other attempting to bury head in bottom - few

ARRANGEMENT IN WATER:

normal distribution all	schooling -
moving into other water sources	near surface
floating towards outlet	crowding water inlet
attempting to leave water	other

BODY SURFACE: *

normal all light & dark patches bleached bloated
bluish film: in patches or all over
grayish-white: in patches or tufts
deep open lesions with pus and blood
swollen areas as furuncles
shallow red ulcers: small or large
body splitting open along midline
muscous on skin
other

FINS: *

normal all	twisted
swollen	eroded
necrotic	spots present: white
frayed	black
bluish white	blood-shot
parasite present	other:

CAUDAL PEDUNCLE: *

slightly swollen	bluish-white
very swollen	fungus-like tufts
necrotic	other
inflamed	

GILLS: *

gill color: bright red red X pink white
gill cover widely expanded
swollen
covered with mucus, food and dirt particles most
patches: white brown gray
other gills covered with brown deposit, some gills were "frayed". See pathology reports.

* Indicate approximate number of fish having these characteristics. Look for general trends, not specific fish (few, many, all, none).

100070

Fish Kill No. 78-011

(Red)

EYES: *

normal all	bulging
opaque	one eye missing
white: lens or center	both eyes missing
tiny spots in lens	if a needle is inserted in the eye socket
red spots in cornea	and the eye is pressed while fish head is
popeye	under water, gas bubbles or opaque
other	fluid escapes.

* Indicate approximate number of fish having these characteristics. Look for general trends, not specific fish. (few, many, all, none)

OTHER CONDITIONS OR SYMPTOMS NOTED:

See Pathology Reports

5.0 SAMPLES AND ANALYSES:

5.1 CHEMICAL SAMPLES COLLECTED:
(circle samples not collected by State Water Control Board)

source (pollution) 2	polluted area
source (oil)	spill area
1/2 gallon glass	quart plastic 2
gallon plastic	quart glass 3
mercury bottles 1	mud
	soil

5.2 BIOLOGICAL SAMPLES COLLECTED: *
(circle samples not collected by State Water Control Board)
Fish must be properly identified to genus on lab sheet

fish	benthic
oyster	clam
crab	mussel
other	other

* Specify whole fish, edible meat or organs to be analized

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ORIGINAL
(Red)

Segment	Species	No.	size	Species	No.	size	Species	No.	Size
23rd. 100 yds.	minnows	34	all	s.m. bass	3	4	sunfish	1	5
	suckers	4	0-3	sunfish	1	2			
	s.m. bass	10	2	"	2	3			
	"	25	3	"	1	4			
24th. 100 yds.	minnows	84	all	s.m. bass	4	4	madtoms	1	all
sunfish (1-2"),(4-3")	suckers	1	14	"	1	5	eel	1	11
(3-4"),(2-5")	s.m. bass	44	2	"	1	6	"	2	24
	"	31	3	"	1	10			

Sample Fish Calculation:

Length of kill - 11.5 mi. = 20,240 yds.

Number 100 yd segments - 24 x 100 = 2400 yds.

Expansion factor - $\frac{20240}{2400} = 8.433$

Total number of suckers in 0 to 3 inch length category for all 24 segments combined - 105

105 x 8.433 = 885.5 or 886

886 - Estimated number of suckers in 0 to 3 inch category for entire kill area.

100072

Fish Kill No. 78-011

ORIGINAL
(Red)

9.0 COST:

Cost of investigation: Bureau of Surveillance and Field Studies, Individual sheets: $2169.42 Enforcement
Other: lab $24.25
Cost of freshwater fish (Commission of Game and Inland Fisheries): $7,047.03
Cost of marine fish:
Other cost (explain):
Total cost to State of Virginia: $9,240.70

Copies: Director BSFS, Regional Office, Enforcement, DES File (orig.), Commission of Game and Inland Fisheries, Investigator, HATS File

Report completed and distribution made: _____ _____
(signed) (date)

Enclosures:

MISC. NOTES:

History of Past Problems - Monitoring Data and Fish Kills

The SWCB has pH data for water quality monitoring stations on the Piney River and Tye River over the past 4 to 7 years. (See the attached map and table for station locations and summary of the data). Note that nearly half (19 of 41) of the pH readings taken at station B, the first station below the Piney River discharge, were below the minimum pH standard for this class of waters. However, the majority (15) of these low readings occurred in 1973 and 1974. The last pH standard violation on record for this station occurred on 3-24-76, the only violation to occur at that station that year. The other two stations (C and D) downstream on the Tye River followed a similar pattern. The last recorded violation at Station C, occurred on 8-29-75, and at station D on 10-24-72.

The Board has received reports of, and made investigations of, four fish kills on the Piney and Tye Rivers in the 1970's prior to 78-011. The first report, 71-049 was received in August 1971, and although no fish were found, the stream pH was less than 4.0. No additional reports were received until late summer 1976, when 3 reports were received within a six week period (77-013, 77-036 and 77-056). Only 20 to 30 badly decomposed fish were found during the first investigation on 14 July 1976. No dead fish were found during the investigation of 77-036 two weeks later. No fish were found during the investigation of 77-056 on 2 September 1976, but a break in the berm of the lower lagoon was discovered and the leak was reaching the stream, turning it red below the discharge and lowering its pH to 4.5.

The above discussion makes it apparent that pH conditions in the river had improved in the last two or three years compared to the early 70's. Biological recovery was taking place and fish were moving back into the area, when a series of minor spills and/or kills occurred between late July and early September 1976. No further problems occurred until the July 11, 1977 fish kill.

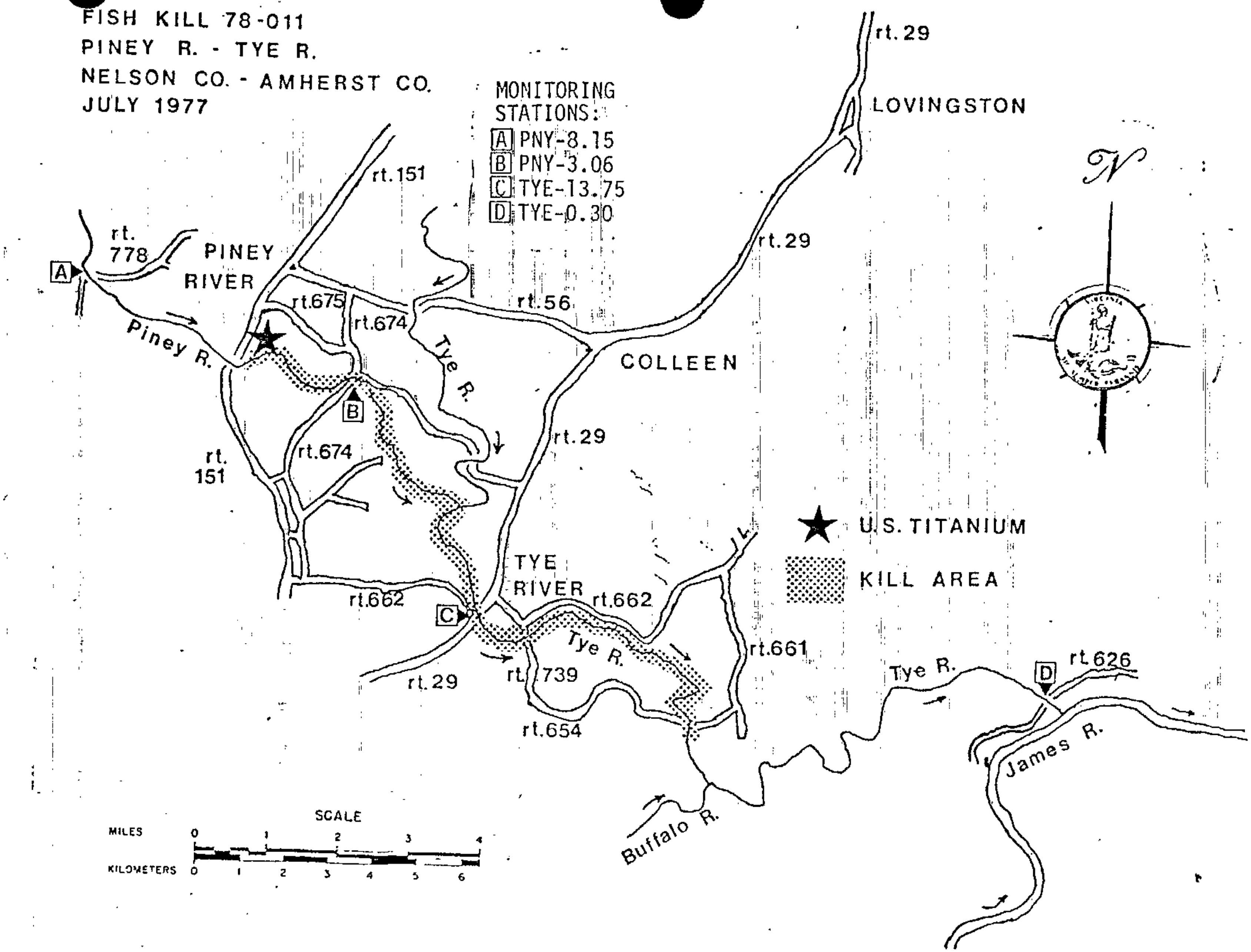
ORIGINAL
(Red)

MISC. NOTES (continued):

That the river was just undergoing biological recovery and repopulation was underscored by the size distribution of the smallmouth bass count. Of the 5,547 total, 96% were four inches or less in length.

ORIGINAL
(Red)

FIGURE 4
FISH KILL 78-011
PINEY R. - TYE R.
NELSON CO. - AMHERST CO.
JULY 1977



Summary of pH Data for Monitoring Stations on the Piney and Tye Rivers, Va.

Station No.	River Mile	Data From/To	Location	No. of pH Readings	Under 6 No.	Under 6 %	Over 8.5 No.	Over 8.5 %
A	PNY 8.15	3/25/70 - 7/1/77	Piney R., Rt. 778 bridge at Nelson-Amherst Co. line, Approx. 3 mi. above U.S. Titanium discharge.	77	2	2.6	2	2.6
B	PNY 3.06	4/5/73 - 7/1/77	Piney R., Rt. 674 bridge at Rose Mill. approx. 3 mi. below U.S. Titanium discharge.	41	19	46%	0	0
C	TYE 13.75	4/6/73 - 6/21/77	Tye R., Rt. 296 bridge, approx. 6.5 mi. below U.S. Titanium	41	5	12%	0	0
D	TYE 0.30	3/25/70 - 6/21/77	Tye River, Rt. 626 bridge, Nelson Co. just above confluence with James R., approx. 20 mi. below U.S. Titanium.	77	16	21%	0	0

100076

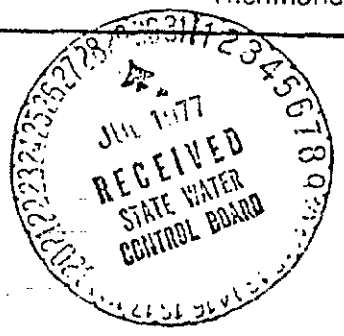
ORIGINAL (Red)

MEMORANDUM

ORIGINAL
(Red)

State Water Control Board

2111 North Hamilton Street P. O. Box 11143 Richmond, VA. 23230



SUBJECT: Tye River Fish Kill

TO: ~~Ron~~ Gregory

FROM: Rod Bodkin RNB

DATE: 28 July 1977

COPIES: VRO File
Tedd Jett

On Monday 11 July 1977, Larry Simmons and the writer responded to a PReP call from the Nelson County Sheriff's Department regarding a fish kill on the Tye River. According to the report many dead fish of all species had been seen at the Route 739 bridge near the community of Tye River. We arrived at the Route 739 bridge at approximately 4:00 p.m. and were able to observe many dead and dying fish. The majority of the dead fish consisted of smallmouth bass approximately 3 - 4" in length; however, many other species were seen including suckers, catfish, bluegills, and various minnows. The pH and dissolved oxygen concentrations were measured at this time and found to be 6.2 and 7.9 mg/l respectively, and a distressed smallmouth bass was collected. There was a small backwash area just under the bridge where a large number of fish had collected and where some were still in distress. Approximately four distressed smallmouth bass were collected from this area. pH and dissolved oxygen concentrations were also measured here and found to be 5.2 and 7.9 mg/l respectively.

We then proceeded toward the community of Piney River in order to confirm the source of the kill. The Tye River was observed at the Route 158 bridge which is above the confluence of the Tye and Piney Rivers. We saw several large schools of minnows and no dead fish were noted. Our next observation was at the Route 674 bridge over the Piney River near the community of Roses Mill. We saw hundreds of dead minnows littering the stream banks and we were not able to observe any live fish in this area. pH and dissolved oxygen concentrations were measured here and found to be 6.2 and 7.9 mg/l respectively.

Upon arrival at the abandoned American Cyanimid Plant an attempt was made to look at some of the old tailing ponds; however, not being familiar with the site we were unable to do so. Contact was made with a man at the plant site who apparently worked for Higgins Engineering but no relevant information was obtained. An observation of the Piney River was made at the Route 151 bridge near the community of Piney River. Abundant fish life was observed and no dead or dying fish were seen.

In order to ascertain the area of kill involved we returned to the community of Tye River and drove downstream looking at the river at every accessible point for dead fish. We did not see any dead fish at the Route 654 bridge and we therefore assumed that the kill ended just above this point.

100077

ORIGINAL
(Red)

At 7:15 p.m. we met with Deputy Sheriff Woods and Game Warden Gary Brantley. They had both seen a discharge from a tailing pond at the old American Cyanimid site at approximately 3:00 p.m. and they had collected and refrigerated a sample of the effluent. They had also collected and refrigerated two water samples taken from the Route 739 bridge on the Tye River. We then returned to Bridgewater with the samples and arrangements were made to have them submitted to Consolidated Laboratories in Richmond.

jes

MEMORANDUM

ORIGINAL
(Red)

State Water Control Board

2111 North Hamilton Street P. O. Box 11143 Richmond, VA. 23230

SUBJECT: Tye River Fish Kill - Follow Up Memo

TO: Ron Gregory

FROM: Rod Bodkin RB

DATE: 2 September 1977

COPIES: VRO File
Tedd Jett

This memo is a follow up to the one previously written on the subject fish kill on 28 July 1977. As mentioned in the previous memo Larry Simmons and the writer observed many fish in distress upon arrival at the Route 739 bridge. All of the distressed fish were smallmouth bass approximately 3 - 4 inches in length.

The first distressed bass was observed from the bridge swimming lethargically at the top of the river and drifting aimlessly with the current. We then went down to the shore line about 60 yards downstream of the bridge and we were able to see the distressed bass drifting toward the shore line. The bass was then observed rubbing itself vigorously on small rocks on the bottom of the river. It exhibited this behavior at two different times while we were watching it. The fish was then collected and put on ice.

We saw many distressed smallmouth bass in the backwash area under the Route 739 bridge as mentioned in paragraph one of the previous memo. Most the dying fish were lying on or near the bottom and were gasping. Four dying smallmouth bass were collected from this area and only one made an attempt to get away when we were trying to collect it.

jes

Fish Kill No. 78-011

ORIGINAL
(Red)

5.3 CHEMICAL ANALYSIS
check box for requested analysis

Station	1	2		
Date	7-13-77	7-13-77		
Time	1240	1230		
Lab Number	13787	13786		
Parameter -				
BOD_5, mg/l				
MPN / 100 ml				
pH (laboratory	7.5	5.9		
Acidity (total) mg/l	10	3		
Alkalinity (total), mg/l				
Phth Alkalinity, mg/l				
Settleable Solids, mg/l				
Total Solids - tot, mg/l				
Vol, mg/l				
Fix, mg/l				
Susp. Solids- Tot, mg/l				
Vol, mg/l				
Fix, mg/l				
Chlorides, mg/l as Cl				
Tot Nit, kjel, mg/l as N				
Ammonia, mg/l as N				
Nitrite, mg/l as N				
Nitrate, mg/l as N				
Hydrol. Phosphates, mg/l as P				
Ortho Phosphates, mg/l as P				
Total Phosphates, mg/l as P				
Chromium Tot, mg/l				
Zinc, mg/l				
Lead, mg/l				
Iron, mg/l				
Copper, mg/l				
Manganese, mg/l				
Hexane Extractables, mg/l				
Chemical Oxygen Demand, mg/l				
Oils by Infrared, mg/l				
				100030

5.3 CHEMICAL ANALYSIS
check box for requested analysis

	Station	3	3	7	7
	Date	7-12-77	7-11-77	7-11-77	7-11-77
	Time	2100	1530	1200	1200
	Lab Number	L-79	L-78	L-77	L-76
	Parameter	metals bottle			
☐	BOD_5, mg/l				
☐	MPN / 100 ml				
☒	pH (laboratory		2.5	4.8	4.8
☐	Acidity (total) mg/l				
☐	Alkalinity (total), mg/l				
☐	Phth Alkalinity, mg/l				
☐	Settleable Solids, mg/l				
☐	Total Solids - tot, mg/l				
	Vol, mg/l				
	Fix, mg/l				
☐	Susp. Solids- Tot, mg/l				
	Vol, mg/l				
	Fix, mg/l				
☐	Chlorides, mg/l as Cl				
☐	Tot Nit, kjel, mg/l as N				
☐	Ammonia, mg/l as N				
☐	Nitrite, mg/l as N				
☐	Nitrate, mg/l as N				
☐	Hydrol. Phosphates, mg/l as P				
☐	Ortho Phosphates, mg/l as P				
☐	Total Phosphates, mg/l as P				
☒	Chromium Tot, mg/l	0.10			
☒	Zinc, mg/l	0.20			
☒	Lead, mg/l	0.1-			
☒	Iron, mg/l	1,500			
☒	Copper, mg/l	0.40			
☐	Manganese, mg/l				
☐	Hexane Extractables, mg/l				
☐	Chemical Oxygen Demand, mg/l				
☐	Oils by Infrared, mg/l				
☒	Sulfate	5,000	5,600	48	38
☐	TOC		11	4	4
☒	Conductivity (micro-mhos/cm)		4400		110
☐					
☐					
☐					

100081

Figures 3A and 3B. Field and Laboratory Data. The following two maps contain a summary of all field and laboratory chemical data. All chemical data other than pH is given in mg/l.

LEGEND:

① Station number

7-13-77 Month-day-year

1240 RG Military time (NR = Not Recorded)

Initials of person collecting sample and/or performing field tests:

RG = Ronald A. Gregory
JR = John V. Roland
GB = Gary Brantley
RB = Roderick V. Bodkin

F pH = field pH

L pH = laboratory pH

DO = dissolved oxygen

Cr = chromium

Cu = copper

Fe = iron

Pb = lead

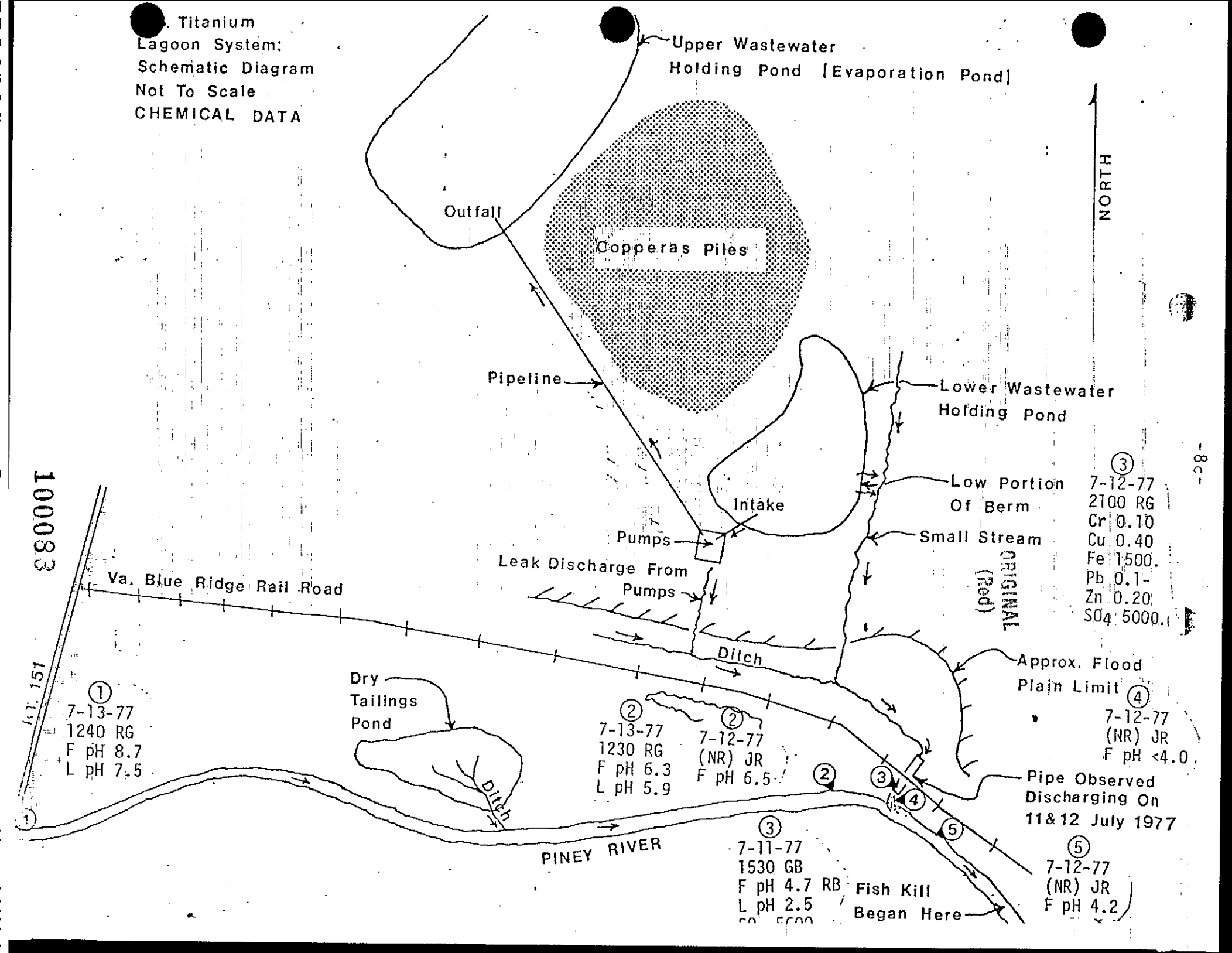
Zn = zinc

SO_4 = sulfates

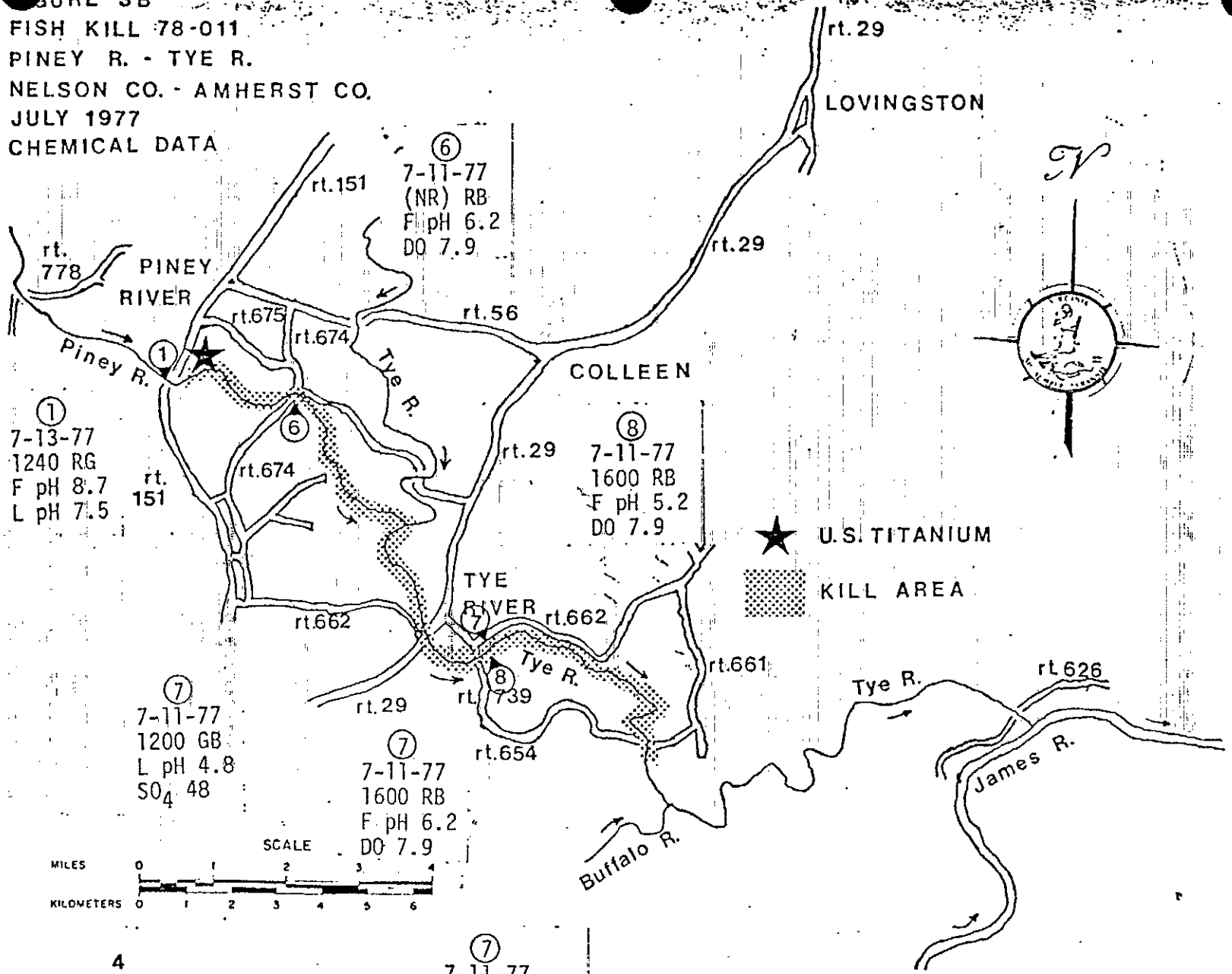
< = "less than"

① Station location

100082


Titanium
Lagoon System:
Schematic Diagram
Not To Scale
CHEMICAL DATA
Upper Wastewater
Holding Pond (Evaporation Pond)
NORTH
Outfall
Copperas Piles
Pipeline
Lower Wastewater
Holding Pond
Low Portion
Of Berm
Small Stream
Intake
Pumps
Leak Discharge From
Pumps
Va. Blue Ridge Rail Road
Ditch
Dry
Tailings
Pond
Ditch
Approx. Flood
Plain Limit
Pipe Observed
Discharging On
11&12 July 1977
PINEY RIVER
Fish Kill
Began Here
Rt. 151
1000833
ORIGINAL
(Red)
-8c-
① 7-13-77
1240 RG
F pH 8.7
L pH 7.5
② 7-13-77
1230 RG
F pH 6.3
L pH 5.9
② 7-12-77
(NR) JR
F pH 6.5
③ 7-11-77
1530 GB
F pH 4.7 RB
L pH 2.5
③ 7-12-77
2100 RG
Cr 0.10
Cu 0.40
Fe 1500.
Pb 0.1-
Zn 0.20
SO4 5000.
④ 7-12-77
(NR) JR
F pH <4.0
⑤ 7-12-77
(NR) JR
F pH 4.2

GURE 3B
FISH KILL 78-011
PINEY R. - TYE R.
NELSON CO. - AMHERST CO.
JULY 1977
CHEMICAL DATA



4

1000824

ORIGINAL
(Red)

-84-

Fish Kill No. 78-011

ORIGINAL
(Red)

6.0 TOXICITY OF ELEMENTS INVOLVED AS REPORTED IN LATEST LITERATURE:

REFERENCE: See Attached Report

REFERENCE:

REFERENCE:

REFERENCE:

REFERENCE:

REMARKS:

7.0 BENTHIC, ALGAL EXAMINATION (CURSORY):

Station	Substrate	Aquatic plants	Algae	Benthic animals	Tolerance %			How compare with control
					Tol	Fac	Sensit	
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

100085

ORIGINAL
(Red)

6.0 Toxicity of Elements Involved as Reported in the Latest Literature:

A. Chemistry of Copperas

Copperas is ferrous sulfate, $FeSO_4 \cdot 7H_2O$. In the presence of oxygen and water, ferrous sulfate is oxidized to form sulfuric acid and other by-products as shown below:

(1) $12\ FeSO_4 + 3\ O_2 + 6\ H_2O \rightarrow 4\ Fe_2(SO_4)_3 + Fe(OH)_3\downarrow$
copperas oxygen water ferric sulfate ferric hydroxide

(2) $Fe_2(SO_4)_3 + 6\ H_2O \rightarrow Fe(OH)_3\downarrow + 3\ H_2SO_4$
ferric sulfate water ferric hydroxide sulfuric acid

(Herricks and Cairns,n.d.; Yeasted and Shane,1976)

The sulfuric acid produced was responsible for the low pH of the runoff from the copperas piles. Our labgratory results showed that high concentrations of iron and sulfate, $Fe^{+2}$and SO_4^{-2}, were also prescnt in solution in the runoff water, due to dissociation of the water-soluble reactants and products.

B. Effects of Low pH on Fish.

Acceptable pH levels for fish are determined in part by such accompanying conditions as temperature, dissolved oxygen, and the type and amount of other ions present (McKee and Wolf, 1963.) Acceptable values cited in the literature vary considerably, not only from one species of fish to another, but also from investigator to investigator.

Generally, pH levels must be below 5.0 to be lethal, with mortalities progressively increasing below this level (Doudoroff and Katz, 1953). Behavioral and physiological signs of stress begin to appear in the range pH 5.8 to pH 5.0 (Falk and Dunson, 1977). The range pH 5.0 to pH 4.0 is the lower lethal limit for most fish studied, while no references could be found for survival below pH 3.3.

Most of the pH-lethality literature deals with brook trout; typical survival times for that species are as follows:

pH	Survival time for trout	
4.2	up to 88% survival for 5 days	(Dively et. al.,1977)
3.5	32 hours (average)	(Falk and Dunson, 1977)
3.5	3 days (max.)	(Robinson et.al., 1976)
3.25	2 days ("extremely tolerant" fish)	
	1 day (avg.)	(Robinson et.al., 1976)
3.15	11.2 hours (min, after acclim.)	(Falk and Dunson, 1977)
	28.3 hours (max, after acclim.)	

For other species, the following table provides general information (McKee and Wolf, 1963):

pH	
4.6	lower limit for perch
4.3	killed carp in 5 days
4.0	lower limit for bluegill in HCl
3.6	96-Hr. TL_m for bluegill
3.3	trout survived without adverse effects (time unspecified)

When exposed to acidic conditions, fish will exhibit excessive mucous secretion, enlargement of the mucous cells of the gills, nares, and integument, and most importantly; gross disarrangement of the cells of gill lamellae (Daye and Garside, 1976).

From our field investigation we know that the pH in the receiving stream was lowered to at least 4.8 at station 7 which was over seven miles below the plant. Furthermore, this sample was apparently collected several hours after the spill had occurred; the red coloration noted by Mr. Wright at 0630 had dispersed before Warden Brantley collected his sample at 1200. If the stream contained enough effluent to be discolored at one time, it can be assumed that the pH was much lower than 4.8, approaching the pH of 2.5 of the discharge at U.S. Titanium.

In view of the literature cited above, it is highly possible that low pH alone caused the kill. At least one of the fish collected moribound from the kill area exhibited the gill tissue damage, and all of the fish exhibited the excess mucus production, referred to in the literature. Some fish were also observed rubbing and scraping themselves on the substrate. However, there is evidence that other toxicities were involved.

C. Toxicity of Iron, Ferric Hydroxide and Ferrous Sulfate.

The exact mechanism of iron toxicity is not resolved, but the EPA's criteria for iron in order to protect fresh water aquatic life is 1.0 mg/l. Some fish will live in higher concentrations, but death of pike and trout is recorded at 1-2 mg/l. Brandt (1948), cited in the EPA Criteria, found that carp died at a concentration of 0.9 mg/l iron when the pH was 5.5, indicating that the toxicity of iron is greatly increased at low pH levels.

It is believed that the major toxic mechanism of iron is that of the ferric hydroxide formed by the dissociated iron in combination with hydroxyl ions in the water. This compound is a precipitate which ranges in color from yellow to red-brown, and was probably, in suspension, the cause of the color of the ponds and of the river mentioned in this report. Iron oxide, a red solid, can sometimes form from dissolved iron. Death of fish is caused by obstruction and corrosion of the gills as these compounds, especially the hydroxide, are deposited from precipitated floc, or directly precipitate upon the gill tissues. Involved in this can be reaction of the hydroxide with the alkaline mucus of the gills (Douderoff and Katz, 1953; Echavez, 1954; McKee and Wolfe, 1963, Quality Criteria for Water, 1976).

ORIGINAL (Red)

Experiments testing directly the toxicity of ferrous sulfate are cited by Doudoroff and Katz (1953). Carpenter (1927) stated that minnows survived 144 minutes (about 2 1/2 hours) in 0.1 N ferrous sulfate (about 7600 mg/l). Clark and Adams (1912) stated that a concentration of 1.28 ppm Fe in a solution of ferrous sulfate killed "certain fish" within 24 hours. Ellis (1937) and Sanborn (1945) reported that 1,000 ppm $FeSO_4$ in hard water and pH 6.4 was fatal to goldfish in 2 to 10 hours, that 100 ppm in tap water was fatal to black bass and bluegill sunfish in 2.5 to 7 days, but not to goldfish in that period of time, and that 50 ppm and pH 6.6 did not kill bass, bluegill or goldfish in seven days. Belding (1927) found that 133 ppm was the lowest concentration that killed brook trout within 24 hours.

The concentration of iron from the discharge was measured from a sample taken 7-12-77 and found to be 1500 mg/l (ppm). If this were assumed to represent dissociated ferrous sulfate, the concentration of $FeSO_4$ would be about 4,350 mg/l.

It is obvious from the literature that salts of iron, including ferrous sulfate, can be directly toxic to fish, expecially at low pH levels. That high levels of iron occurred in the Piney and Tye can be inferred from the high levels found in the discharge and the reddish discoloration of the receiving streams far below the discharge. In addition. several of the fish collected for pathological examination had the dark brown coating of precipitated iron on their gills, which undoubtedly restricted respiration and may have suffocated them.

Conclusion: The kill was caused by low pH copperas runoff either via the injurious effects of low pH alone, or low pH acting in concert with iron, whose toxicity is enhanced by low pH. Futhermore there was evidence of iron precipitation on gill surfaces which would have hindered respiration and may have led to suffocation.

ORIGINAL
(Red)

REFERENCE: Daye, P.G., and E.T. Garside. 1976. Histopatholic changes in Surficial Tissues of Brook Trout, Savelinus fontinalis (Mitchill), Exposed to Acute and Chronic Levels of pH. Canadian Jour. of Zoology, Vol. 54, No. 12, pp. 2140-2155.

REFERENCE: Dively, J., J. Mudge, W. Neff, and A. Anthony. 1977. "Blood Po_2, Pco_2 and pH Changes in Brook Trout (Salvelinus fontinalis) Exposed to Sub-lethal Levels of Acidity," Comp. Biochem. Physiol., Vol. 57A, pp. 347-351.

REFERENCE: Doudoroff, P. and M. Katz. 1953. Critical Review of Literature on the Toxicity of Industrial Wastes and Their Components to Fish. II. The Metals, as Salts. Sewage and Industrial Wastes. 25:7.

REFERENCE: Doudoroff, P. and M. Katz. n.d. "A Summary of Literature on Toxicity of Alkalies, Acids, and Inorganic Gases to Fish."

REFERENCE: Echave, H.S. 1954. Studies of Tolerance of Fresh Water Fish to Strong Acids and Acid Mine Wastes. Master's Thesis in Sanitary Engineering, The Johns Hopkins University, 1954. In: C.E. Renn, H.H. Hobbs, Jr. and B.F.D. Runk. 1955. Biological Survey of the Piney River, Va. and Evaluation of Effects of Water-Borne Wastes. Report to American Cyanamide Co. (unpublished).

REFERENCE: Falk, D.L. and M.A. Duncan. 1977. Water Research. Vol. 11, pp. 13-15.

REFERENCE: Herricks, E.E., and John Cairns, Jr. n.d. Bulletin 66: Rehabilitation of Streams Receiving Acid Mine Drainage, Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University (Blacksburg).

REFERENCE: McKee, J.E. and H.W. Wolf (eds.). 1963. Water Quality Criteria, Second Edition. California State Water Resources Control Board.

REFERENCE: Robinson, G., W. Duncan, and G. Mamolito. 1976. Differences in Low pH Tolerance Among Strains of Brook Trout (Savelinus fontinalis). Jour. Fish Bio. Vol. 8, No. 1, p. 5 ff.

REFERENCE: United States Environmental Protection Agency. 1976. Water Quality Criteria for Water. U.S. EPA, Washington, D.C. 20460

REFERENCE: Yeasted, J. and R. Shane. 1976. pH Profiles in a River System with Multiple Acid Loads. Jour. Water Pol. Cont. Fed., Vol. 48, No. 1, p. 91.

Fish Kill No. 78-01

ORIGINAL
(Red)

8.0 ROUGH FIGURES FOR FISH COUNT:

8.1 Lake, pond or river; total count of every fish: _____

OR

8.2 100 yard segment/half mile area count; lake or river: 73,056

Total distance of kill in stream/pond miles/acres: 11.5 miles

Segment	Species, No.	size	Species, No.	size	Species, No.,	Size
(1st. fish seen) 1st. 100 yds.	minnows 97	all	suckers 3	9-10		
	suckers 3	0-3				
	" 1	4-6				
	" 1	7-8				
2nd. 100 yds.	minnows 36	all				
	suckers 1	0-3				
	" 1	4-6				
	s.m. bass 1	3				
3rd. 100 yds.	minnows 35	all				
	s.m. bass 1	3				
	madtoms 1	all				
4th. 100 yds.	minnows 134	all				
5th. 100 yds.	minnows 431	all				
	suckers 3	0-3				
	" 1	4-6				
	s.m. bass 2	3				
6th. 100 yds.	minnows 319	all	sunfish 1	3		
	darters 1	all				
	suckers 2	0-3				
	s.m. bass 1	3				
7th. 100 yds.	minnows 354	all	madtoms 2	all		
	suckers 1	4-6				
	" 1	9-10				
	s.m. bass 1	4				
8th. 100 yds.	minnows 367	all	madtoms 1	all		
	suckers 2	9-10	sunfish 1	3		
	" 1	11	" 1	4		
	s.m. bass 2	3	" 1	7		
9th. 100 yds.	minnows 525	all	s.m. bass 1	5	sunfish 1	6
	suckers 1	4-6	madtoms 1	all		
	s.m. bass 6	3	sunfish 1	3		
	" 7	4	" 1	4		

100090

ORIGINAL
(Red)

Segment	Species,	No.,	Size	Species,	No.,	Size	Species,	No.,	size
10th. 100 yds.	minnows	239	all	s.m. bass	9	2	sunfish	1	4
	suckers	7	0-3	"	15	3			
	"	1	7-8	"	2	4			
	"	1	11	madtoms	4	all			
11th. 100 yds.	minnows	724	all	s.m. bass	2	2	madtoms	4	all
	suckers	4	4-6	"	1	3	eel	1	24
	"	1	7-8	"	2	4			
	"	1	11	"	1	5			
12th. 100 yds.	minnows	649	all	s.m. bass	2	3	rockbass	1	4
	suckers	3	4-6	"	5	4	"	1	7
	"	1	14	"	1	5			
	madtoms	9	all	sunfish	1	4			
13th. 100 yds.	minnows	565	all	suckers	1	11	s.m. bass	6	5
sunfish 3 3	suckers	4	0-3	s.m. bass	17	2	"	1	8
" 4 4	"	5	4-6	"	10	3	madtoms	11	all
	"	1	7-8	"	13	4			
14th. 100 yds.	minnows	1,912	all	suckers	6	9-10	s.m. bass	20	3
madtoms 5 all	suckers	7	0-3	"	4	12	"	17	4
sunfish (2-2"),(7-3"),	"	18	4-6	"	7	14	"	2	5
(6-4"),(2-5"),(2-6"),(2-7")	sucker	5	7-8	s.m. bass	30	2	"	1	6
15th. 100 yds.	minnows	352	all	suckers	2	12	sunfish	1	3
rockbass 1 5	suckers	1	0-3	s.m. bass	36	2	"	1	4
" 1 7	"	1	4-6	"	19	4	"	1	6
suckers 1 15	"	3	9-10	"	1	6			
16th. 100 yds.	minnows	86	all	suckers	5	9-10	s.m. bass	10	4
	suckers	17	0-3	"	2	12	sunfish	2	3
	"	1	4-6	s.m. bass	38	2	"	1	5
	"	2	7-8	"	33	3	"	1	7
17th. 100 yds.	minnows	145	all	suckers	5	9-10	s.m. bass	36	3
sunfish (3-2"),(1-3")	suckers	6	0-3	"	1	11	"	1	5
(1-4"),(1-7")	"	2	4-6	"	1	12	madtoms	2	all
	"	1	7-8	s.m. bass	9	2			
18th. 100 yds.	minnows	165	all	suckers	3	12	s.m. bass	10	3
	suckers	6	0-3	"	2	14	sunfish	2	3
	"	6	9-10				"	1	4
	"	1	11	s.m. bass	4	2			
19th. 100 yds.	minnows	123	all	s.m. bass	3	4	sunfish	1	4
	suckers	6	0-3	"	1	5	"	1	5
	s.m. bass	42	2	sunfish	3	2	"	2	6
	"	10	3	"	6	3			
20th. 100 yds.	minnows	38	all	s.m. bass	7	3			
	suckers	1	0-3	sunfish	1	5			
	"	2	2						
	s.m. bass	5	2						
21st. 100 yds.	minnows	96	all	s.m. bass	33	3	sunfish	1	1
	suckers	1	0-3	"	6	4	rockbass	1	3
	"	1	12	"	1	7			
	s.m. bass	6	2	madtoms	1	all			
22nd. 100 yds.	minnows	133	all	suckers	1	11	s.m. bass	17	3
sunfish 2 7"	suckers	36	0-3	"	2	12	"	5	4
	"	1	7-8	"	1	13	"	1	5
	"	1	9-10	s.m. bass	22	2	"	1	10

100091

MEMORANDUM

ORIGINAL
(Red)

State Water Control Board

2111 North Hamilton Street — P. O. Box 11143 — Richmond, VA. 23230

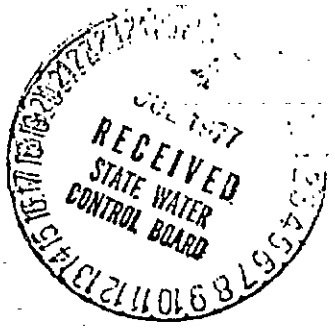
SUBJECT: Piney River - Tye River Fish Kill FY 78-011 (PC 78-028)

TO: Ron Gregory

FROM: Tom Mizell Tom Mizell

DATE: 25 July 1977

COPIES: PREP Coordinator
T. H. Jett
BAT
BE



On 11 July 1977 the VRO received notification of a fish kill on the Tye River. Larry Simmons and Rod Bodkin investigated the river that date accompanied by Gary Brantley, Game Warden and Nelson County Deputy Sheriff Ron Wood. The kill was initially reported by Mr. William D. Wright (Phone 804-263-4628 of Arrington, Virginia on the morning of 11 July 1977.

On 12 July 1977 the writer and Chuck Auckerman met with the following persons to continue the investigation:

Gary Brantley, Game Warden (Phone 804-263-4012)
Ron Wood, Nelson County Deputy Sheriff (Phone 804-263-4242)
Woody Greenberg, Public Project Technician, Nelson County(Phone 804-263-4873)
Ron Gregory, DES
John Roland, BSFS
Mark Stedfeld, DES
Dennis Testerman, DES

Messrs. Brantley, Wood, Greenberg, and Mizell made an onsite investigation of U. S. Titanium's facilities at Piney River while the others began counting dead fish. Mr. Brantley and Mr. Wood noted that on 11 July 1977 they observed a discharge from U. S. Titanium's facilities to Piney River. This occurred subsequent to a Sunday night rainfall approximating 3/4" of rain. Mr. Brantley and Mr. Wood further noted that observations of the rivers on Sunday 10 July 1977 did not reflect any problems.

Prior to leaving the VRO the writer had contacted Brian Higgins of Higgins Engineering who operates the wastewater pumping system for U. S. Titanium. During the telephone conversation Mr. Higgins was made aware of a fish kill and advised of a possible malfunction of the waste holding facilities at U. S. Titanium facilities at Piney River (which consists of two holding ponds to recycle rainfall runoff from waste copperas piles).

100092

ORIGINAL
(Red)

When we arrived on site approximately 11:15 A.M. we viewed the metal culvert, adjacent to the railroad tracks, discharging to Piney River. This was reported by Mr. Brantley and Mr. Wood as discharging on 11 July 1977. Attachment 1 reflects our visual observations on 12 July 1977. We traced the flow from the above mentioned culvert, as it parallels the Virginia Blue Ridge Railroad tracks, for approximately 300 feet. The flow was observed to be red indicative of the wastewaters contained in the wastewater holding ponds. The lower pond was observed to be filled and overflowing at a low point in the southeastern corner of the surrounding berm. The overflow was mixing with the small stream which parallels a portion of the berm resulting in the red coloration. Woody Greenberg, also a free lance reporter, took movies of the flow into Piney River and from the lower pond.

Mr. Higgins had arrived at the site approximately the same time and cut the pumps on shortly before we viewed the lower pond. When questioned Mr. Higgins could not tell the writer when the pumps were last operated. The pumps are operated manually. Mr. Higgins had also placed a few shovels of dirt in the low point to eliminate the discharge from the lower pond. The writer advised Mr. Higgins to place some more dirt in the depression to attempt to assure the berm's integrity and provide additional holding capacity. Mr. Higgins was also requested to improve the berm at the southeastern corner to provide a few more inches holding capacity. He added more dirt in the depression but he was not receptive to modifying the corner as he explained it serves as an emergency spillway. His operational arrangements with U. S. Titanium apparently only involves operation of the pumping facilities associated with the wastewater holding ponds. The writer advised Mr. Higgins that the staff would contact U. S. Titanium to notify them of the need to improve the existing facilities.

In previous correspondences from the VRO the need for dredging the final pond has been addressed. Mr. Higgins stated that the pond was last dredged in April 1977.

The upper reservoir was next observed. Considerable storage capacity was available as the discharge pipes were approximately three feet above the water level. It appeared that the water level was approximately six feet below the high water level line.

At approximately 1:30 P.M. the writer contacted the VRO to report the findings of the investigation. It was anticipated that U. S. Titanium would be contacted and advised of the problem (i.e. the need to strengthen the berms and draw the level down in the lower reservoir to provide capacity for additional rainfall runoff from the copperas piles).

Gary Brantley and the writer returned to the site and viewed the lower pond at approximately 2:30 P.M. The level had lowered approximately two inches as reflected by a high water mark on dead trees in the pond. The pumps were operating and Mr. Higgins had apparently left the site. It was noted that a few sacks of dolomitic limestone had been placed in the stream just below the emergency spillway.

The writer then assisted with the fish count. While taking a count at the station just downstream of the Tye River Bridge (State Route 739) Mrs. William Wright introduced herself and described her husband's observation of the previous day i.e. while fishing Monday morning, 11 July 1977, at approximately 6:30 A.M. the stream appeared red. However, by 11:00 A.M. the condition had cleared up. The writer told Mrs. Wright that she would be advised of the staff's findings.

ORIGINAL
(Red)

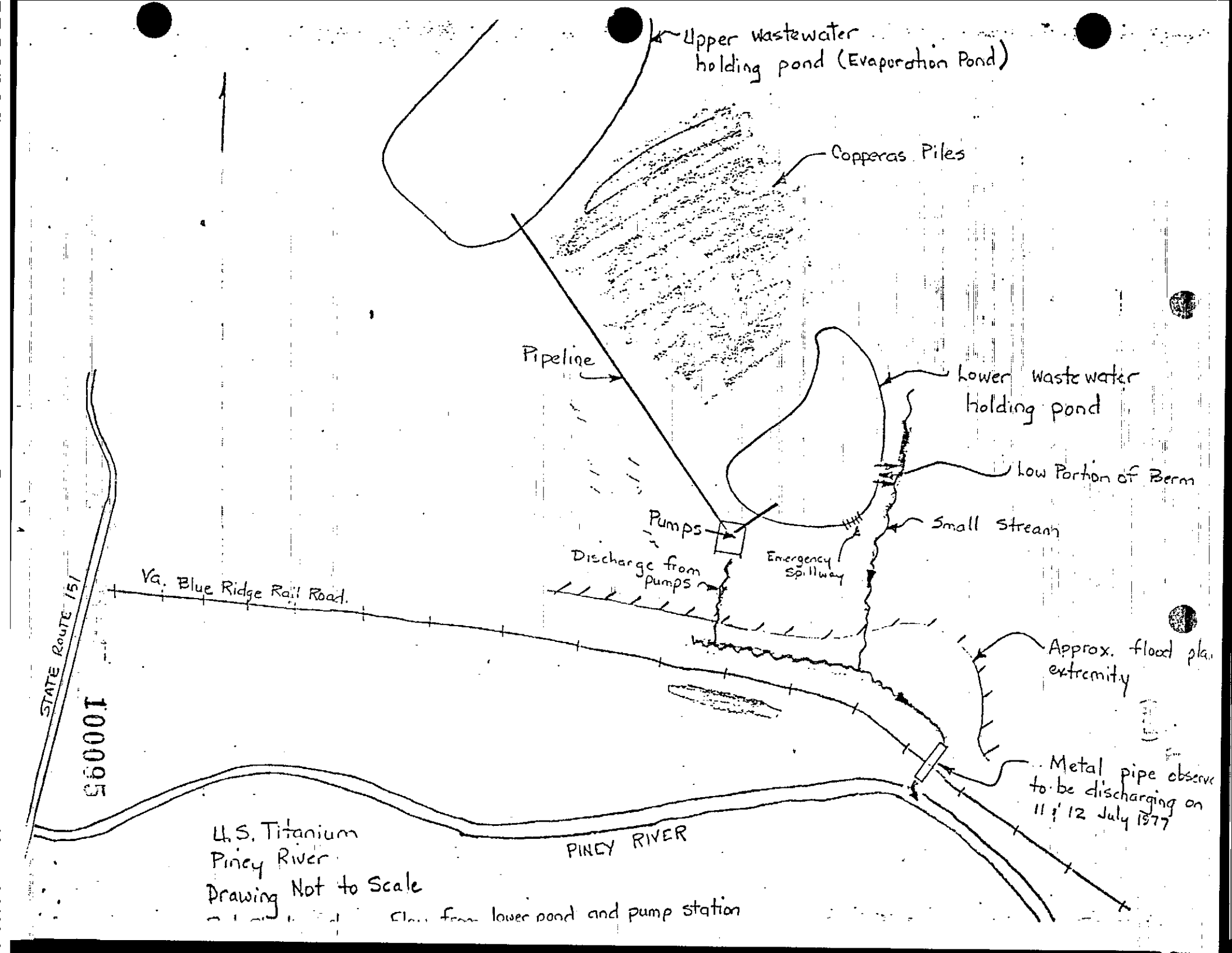
A thunderstorm hit the area in the early evening and prior to leaving the area the writer and Deputy Sheriff Wood and the rest of the SWCB investigators made a final inspection of the U. S. Titanium facilities. The pumps were operating. It appeared that the level in the lower reservoir had risen approximately one inch reflecting the flow contribution due to the rainfall. Deputy Sheriff Wood reported that his rain gage near Piney River indicated 0.6 inch of rain due to the 12 July 1977 thunderstorm. Prior to leaving the site pH measurements of the final ponds contents were obtained by Ron Gregory.

Several slides of the wastewater facilities were taken throughout the day and attachment two reflects the vantage points from which the slides were taken.

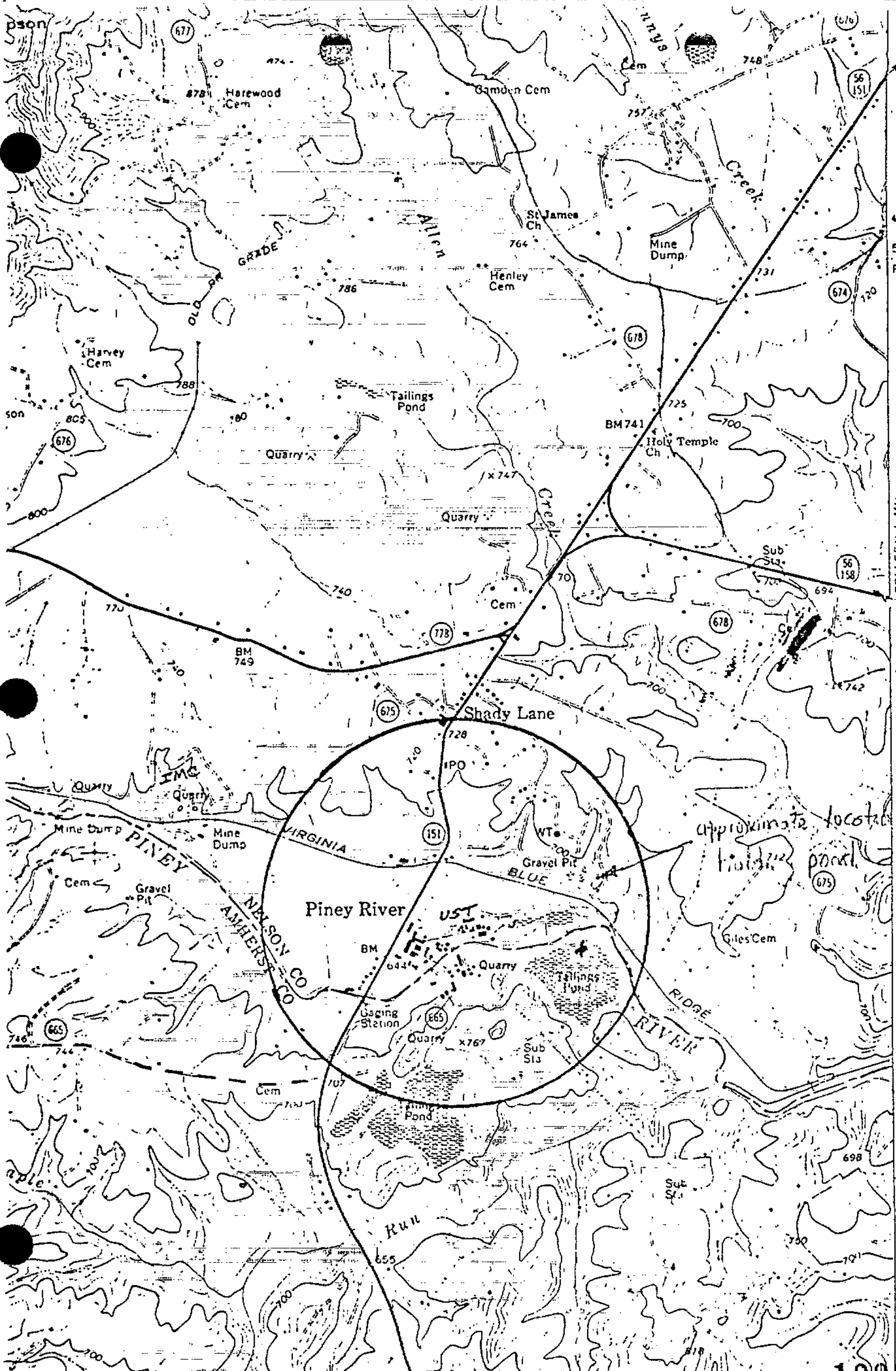
Please refer to separate memorandum reflecting investigation of 11 July 1977.

Woody Greenberg requested that the staff keep Nelson County Board of Supervisors advised of our findings and action. Also since the fish kill Mr. Earl Bryant (263-5547) and John Scott Carter (946-2316)have asked that they also be advised of SWCB action concerning the matter .

CTM/jw

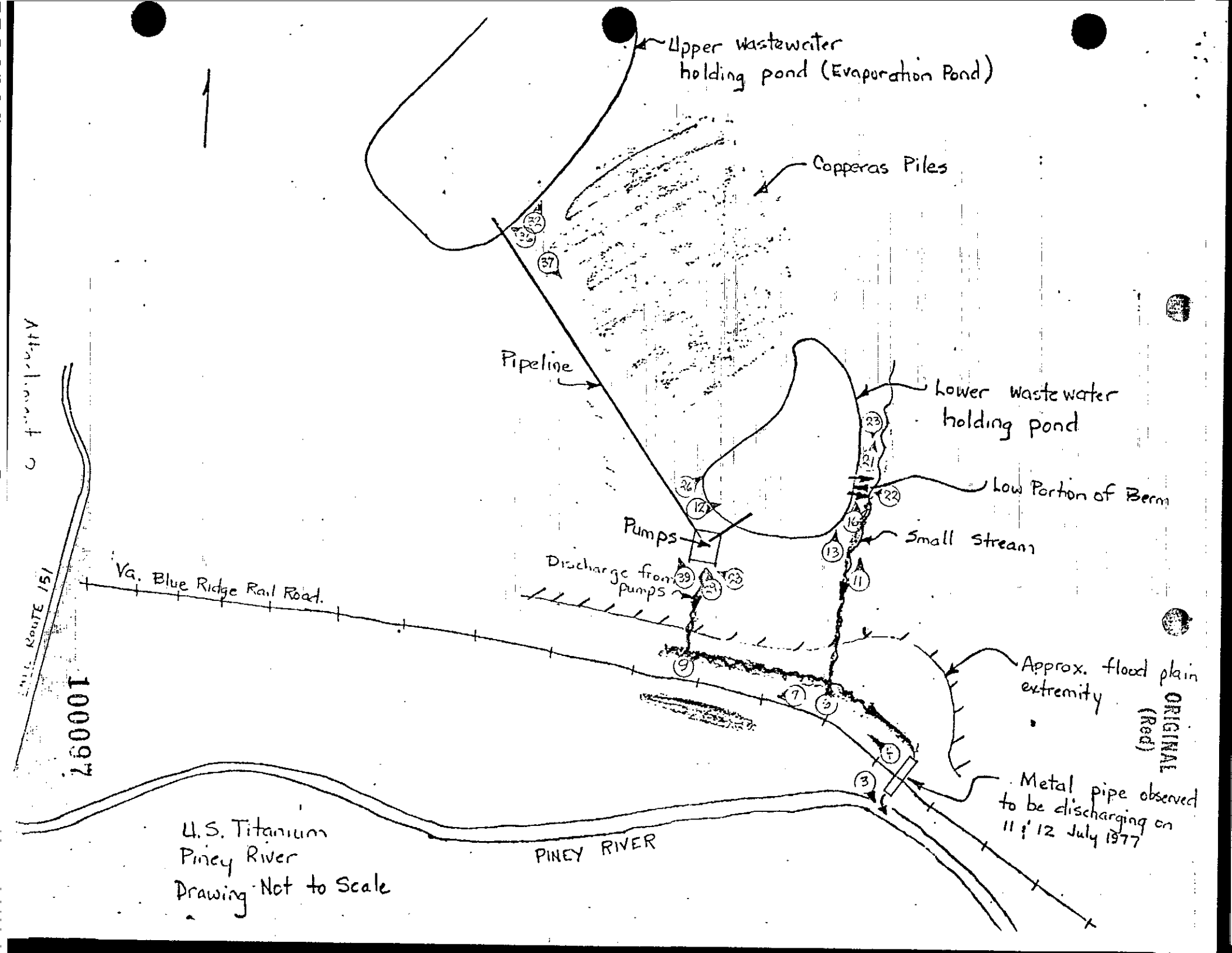

Upper wastewater holding pond (Evaporation Pond)
Copperas Piles
Pipeline
Lower wastewater holding pond
Low Portion of Berm
Small Stream
Pumps
Discharge from pumps
Emergency Spillway
Va. Blue Ridge Rail Road.
STATE ROUTE 151
Approx. flood pla extremity
Metal pipe observe to be discharging on 11 & 12 July 1977
PINEY RIVER
U.S. Titanium
Piney River
Drawing Not to Scale
lower pond and pump station

ORIGINAL
(Red)



approximate location of lower tailings pond

100096


Upper wastewater holding pond (Evaporation Pond)
Copperas Piles
Pipeline
Lower wastewater holding pond
Low Portion of Berm
Small stream
Pumps
Discharge from pumps
Va. Blue Ridge Rail Road.
State Route 151
Approx. flood plain extremity
Metal pipe observed to be discharging on 11 & 12 July 1977
U.S. Titanium
Piney River
Drawing Not to Scale
PINEY RIVER
ORIGINAL (Red)
26009

ORIGINAL
(Red)

PATHOLOGY REPORT

Name David K. Paylor — Fish Kill # 78-011

Species redhorse sucker — Date Received 7/11/77
Size 14" — Date Examined 9/2/77
Sex — Examined moribund ___ dead x
Preservative frozen — Sampled moribund x dead ___

I External

Sides (hemorrhaging, necrosis, parasites, bacteria, etc.):
normal

Fins (hemorrhaging, necrosis, parasites, bacteria, fraying, etc.):
normal

Gills: A. General appearance & color: Gills severely frayed and eroded - in some cases only the filament remains. Yellow-brown foreign substance on filaments and B. Microscopic (hemorrhaging, hyperplasia, aneurysms, bacteria, parasites): in mucous. Large accumulation of foreign material around filaments and in mucous

Other abnormalities:

II Internal

General appearance of viscera (hemorrhaging, edema, parasites, etc.):
normal

Intestinal tract (full, empty, bloody, mucous, parasites, etc.):

Organs (hemorrhaging, color, bacteria, parasites, etc.):

Liver: — Spleen:

Pyloric caeca:

Kidney: — Swim Bladder:

Gall Bladder: — Other:

III Hematology, Histology, Bacteriology, Parasitology --- attach sheets

IV Summary and Conclusions: On one gill approx. 50-60% of outer gill arch was destroyed. Two pathological problems found in gills.

1. Extensive fraying and erosion.
2. Collection of yellow brown foreign material on filaments.

Foreign material was unidentified but was enough to inhibit respiration. There was some mucous production which may have been associated.
The gill erosion was not due to any infectious agent. It could have been caused by a highly corrosive substance in the water.

David K. Paylor

100098

ORIGINAL
(Red)

PATHOLOGY REPORT

Name David K. Paylor — Fish Kill # 78-011

Species smallmouth bass
Size 3-4"
Sex
Preservative frozen

Date Received 7/11/77
Date Examined 9/2/77
Examined moribund ___ dead x
Sampled moribund x dead ___

I External

Sides (hemorrhaging, necrosis, parasites, bacteria, etc.):
normal

Fins (hemorrhaging, necrosis, parasites, bacteria, fraying, etc.):
normal

Gills: A. General appearance & color: Mostly decayed but with yellow brown foreign material in the mucous.
B. Microscopic (hemorrhaging, hyperplasia, aneurysms, bacteria, parasites):
Yellow brown foreign material abundant

Other abnormalities:

II Internal

General appearance of viscera (hemorrhaging, edema, parasites, etc.):
normal

Intestinal tract (full, empty, bloody, mucous, parasites, etc.):

Organs (hemorrhaging, color, bacteria, parasites, etc.):

Liver:
Spleen:
Kidney:
Pyloric caeca:
Swim Bladder:
Gall Bladder:
Other:

III Hematology, Histology, Bacteriology, Parasitology --- attach sheets

IV Summary and Conclusions:

The gills were mostly decayed, possibly because they are very small and require little time to decay. Not much could be concluded except for the abundance of the yellow-brown foreign substance.

David K. Paylor

100099

ORIGINAL
(Red)

REPLACEMENT COST OF FISH

Fish Kill No. 78-011

Species & Common Name	Size (Inches)	Number	Individual Value	Total Value
Anguillidae freshwater				
eel family				
Anquilla rostrata,	11	8	.035	.28
American eel	24	25	.57	14.25
Catostomidae sucker	0-3	886	.06	53.16
family, including:	4-6	329	.11	36.19
Catostomus commersoni,	7-8	110	.17	18.70
white sucker	9-10	295	.23	67.85
Hypentelium nigricans	11	51	.29	14.79
northern hog sucker	12	127	.34	43.18
	13	8	.34	2.72
	14	101	.34	34.34
Centrarchidae sunfish				
family *Amploplites rupestris*	3	8	.57	4.56
rock bass	4	8	.85	6.80
	5	8	1.14	9.12
	6	-		
	7	17	1.99	33.83

Sub-
Grand Total $339.77

Signed: J. M. H. Hunter
(Chief, Fish Division, CGIF)

Date: September 1, 1977

Form 36-75

100100

REPLACEMENT COST OF FISH

ORIGINAL
(Red)

Fish Kill No. 78-011

Species & Common Name	Size (Inches)	Number	Individual Value	Total Value
Lepomis sp. sunfishes	1	8	.11	.68
including *L. auritus*	2	84	.17	14.28
redbreast sunfish	3	261	.23	60.03
	4	186	.29	53.94
	5	67	.40	26.80
	6	51	.68	34.68
	7	51	1.14	58.14
Micropterus dolomieui	2	2311	.57	1,317.27
smallmouth bass	3	2218	.85	1,885.30
	4	818	1.14	932.52
	5	127	1.43	181.61
	6	25	1.71	42.75
	7	17	1.99	33.83
	8	8	2.28	18.24
	9	-		
	10	17	2.85	48.45
	11	8	3.13	25.04
Cyprinidae minnows	all sizes	64,456	.03	1,933.68
baitfish including shiners, dace, chubs, stonerollers, and fallfish				

Grand Total $6,667.44

Signed: [signature]
(Chief, Fish Division, CGIF)

Date: September 1, 1977

Form 36-75

100101

REPLACEMENT COST OF FISH

ORIGINAL
(Red)

Fish Kill No. 78-011

Species & Common Name	Size (Inches)	Number	Individual Value	Total Value
Percidae perch family	all sizes	8	.11	.88
darters				
Ictaluridae catfish	all sizes	354	.11	38.94
Noturus sp. madtoms				
probably *N. insignis*				
margined madtoms				

Sub-Total $39.82

Grand Total 73,056 $7,047.03

Signed: [signature]
(Chief, Fish Division, CGIF)

Date: September 1, 1977

Form 36-75

100102

VIRGINIA STATE WATER CONTROL BOARD
Fish Kill Investigation No. 78-011
Total Costs Summary

ORIGINAL
(Red)

Itemized below are expenses incurred by the Virginia State Water Control Board during the subject fish kill investigation.

Number of personnel involved in investigation: 12

Total man-hours in field and report preparation: 296.5

Total man-hours in laboratory: -

Total wage expense based on hourly rate for all participants: 1898.21

Total wage expense for laboratory: 24.25

Total number of miles driven by State car: 1,102

Total mileage expense for use of state agency, pool car (.15 per mile) 165.30

Total number of miles driven by private car: -

Total mileage expense for use of private car (- cents/mile) -

Total expense for travel by train, plane or bus: -

Rates for boat use:	Daily cost	Hourly operating cost
Canoe and Flatbottom (narrow)	$ 6.25	$ 3.00
Wide Flatbottom	8.50	4.00
Glassmaster 17' Outboard	15.00	6.50
Glassmaster 19' Outboard	25.00	7.50
Glassmaster 19' Inboard	31.00	8.50
Carousel	31.00	8.50
Fish/Ski, T-Craft	37.00	9.00

Number of days boat was used: 2
Number of hours boat was used: 7

Total expense for Boat use: 33.50

Total number of nights spent in field for all participants: -

Total expense for lodging: -

Total number of meals for all participants: 15

Total expense for meals: 34.59

Miscellaneous Items (ice, tolls, film, etc.) include item, quantity, and cost:
ICE, 0.82, FILM+PROC. 12.00
Total expenses for miscellaneous items: 12.82

Bioassay Costs -

Administrative costs 25.00

TOTAL EXPENSES 2193.67

Signed by Ronald A. Gregory

Effective date: _____ Date 7 Sept. 77

100103

LABORATORY COSTS

Fish Kill No. 78-011

ORIGINAL (Red)

Parameter	No. of Analysis	Cost per Analysis	Total Cost
Arsenic		2.00	
BOD_5 mg/l		4.25	
Cadmium		.50	
Calcium		1.00	
Chemical Oxygen Demand, mg/l		5.75	
Chlorides		.60	
Chromium total, mg/l	1	.50	0.50
Coliform, total		3.00	
Coliform, Fecal		1.50	
Conductivity		.75	
Copper	1	.50	0.50
Hardness		1.00	
Herbicides		No Charge	
Hexane Extractables mg/l		17.50	
Iron, mg/l	1	.50	0.50
Infrared, mg/l		50.00	
Lead mg/l	1	1.25	1.25
Manganese, mg/l		.50	
Mercury		1.50	
Nickel		.50	
*Nutrients		5.00	
pH, alkalinity	3	.90	2.70
Pesticides		No Charge	
Settleable Solids		1.00	
Suspended Solids		2.00	
Sulfate	4	1.20	4.80
Total Solids		2.00	
Turbidity		.75	
Zinc, mg/l	1	.50	.50
Others:			
Total Organic Carbon	3	4.00	12.00
Conductivity	2	0.75	1.50

* Nutrients: Tot. Nit., Ammonia, Nitrate, Nitrite, Total Phosphates, Ortho Phosphates, Hydrol. Phosphates.

Grand Total 24.25

Approved by [signature] (Authorized Signature)

100104

Fish Kill No. 78-011

ORIGINAL
(Red)

.1 STATION DESCRIPTION:

1. Piney R., rt. 151 bridge, upstream of U.S. Titanium property.
2. Piney R., U.S.Titanium property, 3 meters upstream of discharge pipe.
3. U.S. Titanium discharge.
4. Pool below U.S. Titanium discharge pipe.
5. Piney R.,U.S. Titanium property, 5 meters below discharge pipe in discharge plume.
6. Piney River, at rt. 674 bridge, Rose Mill, approx. 2.4 km. below U.S. Titanium discharge pipe.
7. Tye R., rt. 739 bridge, Tye River post office, approx. 12 km. below U.S. Titanium discharge pipe.
8. Tye R., backwater pool beneath rt. 737 bridge.
9.
10.

.2 PICTURES TAKEN: (identify pictures: slides (s)* or prints (p))

Location:

1. _____ 6. _____
2. _____ 7. _____
3. _____ 8. _____
4. _____ 9. _____
5. _____ 10. _____

* See attached list. All slides were taken by Tom Mizell, V.R.O. on 12 July 1977. His map following the list shows the locations where some of the slides were taken.

100105

Trip Kit No. 78-011

ORIGINAL
(Red)

5.3 CHEMICAL ANALYSIS
check box for requested analysis

	Station	3	3	7	7
	Date	7-12-77	7-11-77	7-11-77	7-11-77
	Time	2100	1530	1200	1200
	Lab Number	L-79	L-78	L-77	L-76
	Parameter	metals bottle			
☐	BOD_5, mg/l				
☐	MPN / 100 ml				
☒	pH (laboratory		2.5	4.8	4.8
☐	Acidity (total) mg/l				
☐	Alkalinity (total), mg/l				
☐	Phth Alkalinity, mg/l				
☐	Settleable Solids, mg/l				
☐	Total Solids - Tot, mg/l				
	Vol, mg/l				
	Fix, mg/l				
☐	Susp. Solids- Tot, mg/l				
	Vol, mg/l				
	Fix, mg/l				
☐	Chlorides, mg/l as Cl				
☐	Tot Nit, kjel, mg/l as N				
☐	Ammonia, mg/l as N				
☐	Nitrite, mg/l as N				
☐	Nitrate, mg/l as N				
☐	Hydrol. Phosphates, mg/l as P				
☐	Ortho Phosphates, mg/l as P				
☐	Total Phosphates, mg/l as P				
☒	Chromium Tot, mg/l	0.10			
☒	Zinc, mg/l	0.20			
☒	Lead, mg/l	0.1-			
☒	Iron, mg/l	1,500			
☒	Copper, mg/l	0.40			
☐	Manganese, mg/l				
☐	Hexane Extractables, mg/l				
☐	Chemical Oxygen Demand, mg/l				
☐	Oils by Infrared, mg/l				
☐	Sulfate	5,000	5,600	48	38
☐	TOC		11	4	4
☒	Conductivity (micro-mhos/cm)		4400		110
☐					
☐					

100106

FISH KILL # 80-043
STREAM Piney River/Tye River
BASIN James
(XXXX)COUNTY Nelson Co./Amherst Co.

SUMMARY:

On August 25, 1979 eight SWCB staff members investigated a fish kill on the Piney and Tye Rivers (Nelson Co.). The cause of the kill was acidic runoff from the US Titanium Co. property. As a result 26,136 fish of several species were killed. Field and laboratory tests indicated that the state water quality standard for pH was violated. Replacement cost of fish was $ 2,107.16. Cost of investigation was $ 1,189.69. Total cost to the State of Virginia was $ 3,296.85.

CONCLUSIONS:

Acid wastes from the property of US Titanium Co. lowered the pH in the receiving stream (Piney River) to lethal levels causing a fish kill in the Piney and Tye Rivers below the plant site.

THE INVESTIGATION

1.0 REPORTED INFORMATION:

Reported by: Mr. Pete Archbell Date 8-24-79 Time 2050
Report received by: PReP Central Date 8-24-79
Investigated by: L. Simmons, R. Bolgiano Date 8-25-79
Investigated by: Six BSFS staff members Date 8-25-79
Investigated by: Date
Final Report Edited by: D. H. Treacy

CHAIN OF NOTIFICATION (list of names in order of contact)

(1) Enforcement Division Jim Hensley (date) (time)
(2) Regional Representative Simmons, Bolgiano (date) 8-24-79 (time) 2300
(3) Game Warden (CGIF) Bob Bonderant, Amherst Co. (date) 8-24-79 (time) 1600
(4) (name) Dave Paylor, DES (date) 8-24-79 (time) 2320
(5) (name) (date) (time)

DATE FISH KILL OCCURRED (as determined by investigation) 8-24-79
DATE FISH KILL ENDED 8-25-79

PLAINTIFF'S EXHIBIT 330

100107

PROJECT LOG CONTINUED:

AUGUST 25, 1979

0650 PS0-165 FKS0-043 — VALLEY REGION: R. Bolgiano (VRO) and L. Simmons (VRO) enroute to

1100 PS0-165 FKS0-043 — VALLEY REGION: R. Bolgiano (VRO) called requesting headquarters sistance for count

1245 PS0-165 FKS0-043 — VALLEY REGION: D. Paylor, R. Pitchford, D. Treacy, R. Gregory J. Robinson and L. Balderson en route to kill to aid in count.

1500 PS0-165 FKS0-043 — VALLEY REGION: Gary Brantly, Lynchburg News, called and was advi SWCB on scene.

1630 PS0-165 FKS0-043 — VALLEY REGION: Brad Elliot, Lynchburg, requested information on He was advised SWCB personnel were on scene.,

2330 PS0-165 FKS0-043 — VALLEY REGION: D. Paylor (DPS) reported that the count had been pleted.

AUGUST 26, 1979

1200 PS0-165 FKS0-043 — VALLEY REGION: Mr. Childress, Nelson County, reported a fish kil the Tye River. He was advised SWCB personnel had investigated an conducted a fish count.

NO FURTHER ACTIVITY!

Fish Kill No. 80-043

Weather Previous to Kill 8-22-79 - .5" 8-21-79 - 4.4" of rain (rain gauge in Montebello, Va.)
Weather During Kill no rain
Weather Following Kill thunderstorms
(If rain - include amount)

WITNESSES: name _____
address _____
phone _____
position _____

2.0 INVESTIGATORS DISCUSSION:

See memos (Treacy and Bolgiano)

100109

Fish Kill No. 80-043

2.1 STATION DESCRIPTION:

1. Piney River, Rt. 151 bridge, upstream of US Titanium property.
2. Lower lagoon, US Titanium property.
3. Drainage ditch, below lower lagoon, US Titanium property.
4. Drainage outfall of US Titanium into ditch parallel to railroad tracks.
5. Above drainage outfall of US Titanium, US Titanium property.
6. Below drainage outfall, US Titanium property.
7. US Titanium discharge.
8. Piney River, 10 meters above US Titanium discharge
9. Piney River, 20 meters below US Titanium discharge
10. Piney River, downstream from Rt. 674 bridge.

2.2 PICTURES TAKEN: (identify pictures: slides (s) or prints (p))

Location: See attached sheet

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

100110

Fish Kill No. 80-043

Slide No.	Description
1	Looking upstream from control station (Rt. 151 bridge on Piney River).
2	Looking downstream from control station (Rt. 151 bridge on Piney River).
3	Upper lagoon, US Titanium property.
4	Upper lagoon, US Titanium property.
5	Copperas piles, US Titanium property.
6	Lower lagoon, US Titanium property.
7	Lower lagoon, US Titanium property.
8	Pumphouse below lower lagoon.
9	Investigators sampling drainage ditch below pumphouse.
10	Same as 9.
11	Drainage ditch below pumphouse.
12	Drainage ditch below pumphouse (note red color).
13	Earthen berm of lower lagoon (indicating possible overflow).
14	Smoothed areas on earthen berm of lower lagoon (possible overflow).
15	Lower lagoon taken from behind earthen berm.
16	Copperas piles.
17	Lower lagoon.
18	Pipe just below lower lagoon.
19	Small stream leading from lower lagoon drainage.
20	Drainage ditch receiving drainage from areas of copperas piles and leading to discharge areas.
21	Drainage areas moving toward Piney River.
22	Opposite side of RR tracks from drainage areas.
23	Mud on railroad tracks indicating recent overflow to other side of railroad tracks.
24	US Titanium discharge into Piney River.

Fish Kill No. 80-043

3.0 MAP OF AREA: Include company layout, discharges in area, exact extent of kill, extent of visual stream degradation.

FK 80-043

SCALE 1:24 000

1 0

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

ARRINGTON QUAD

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

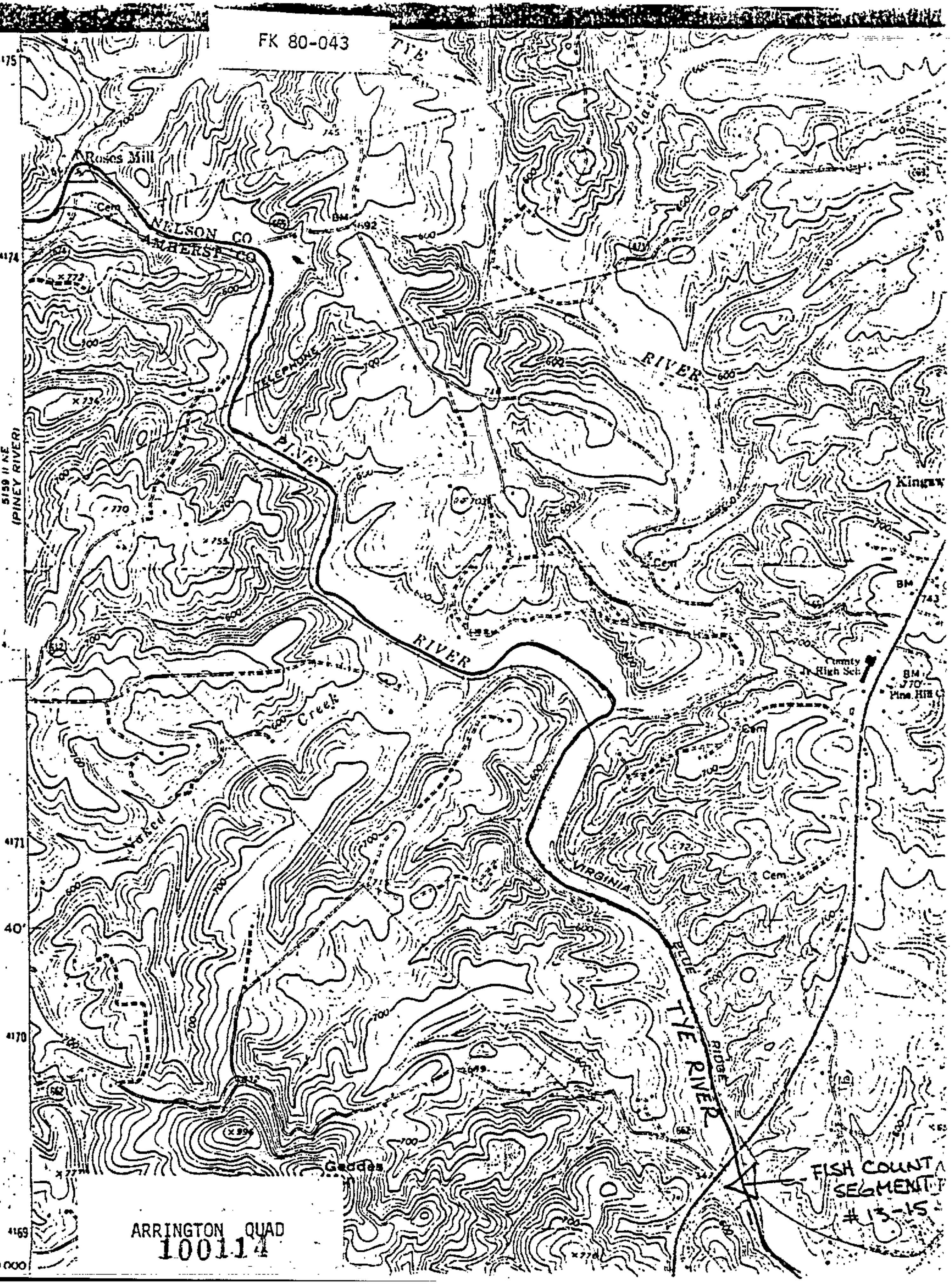
NORTH
SHEET

QUADR

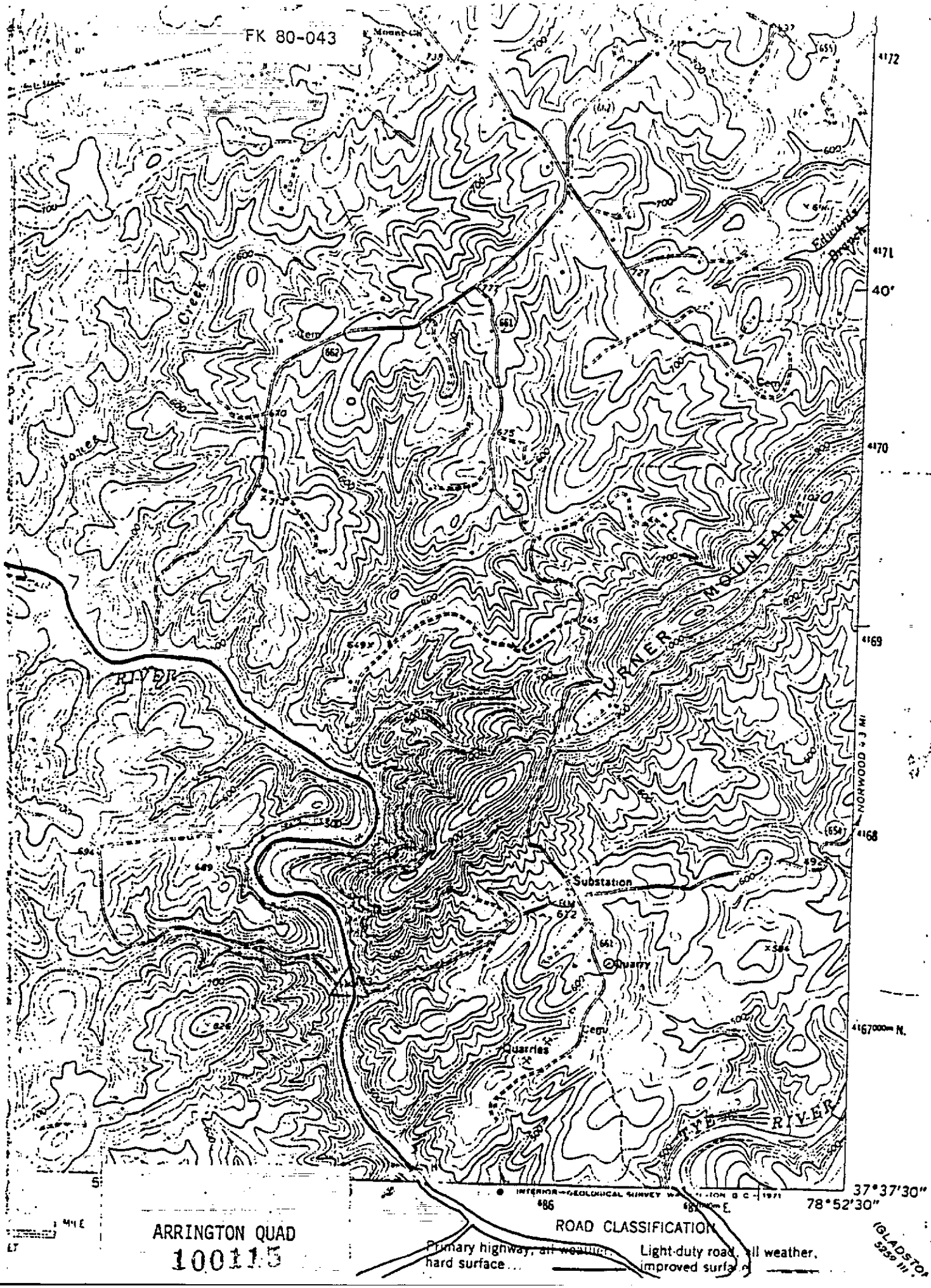
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C. 20242
AND VIRGINIA DIVISION OF MINERAL RESOURCES, CHARLOTTESVILLE, VIRGINIA 22903
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

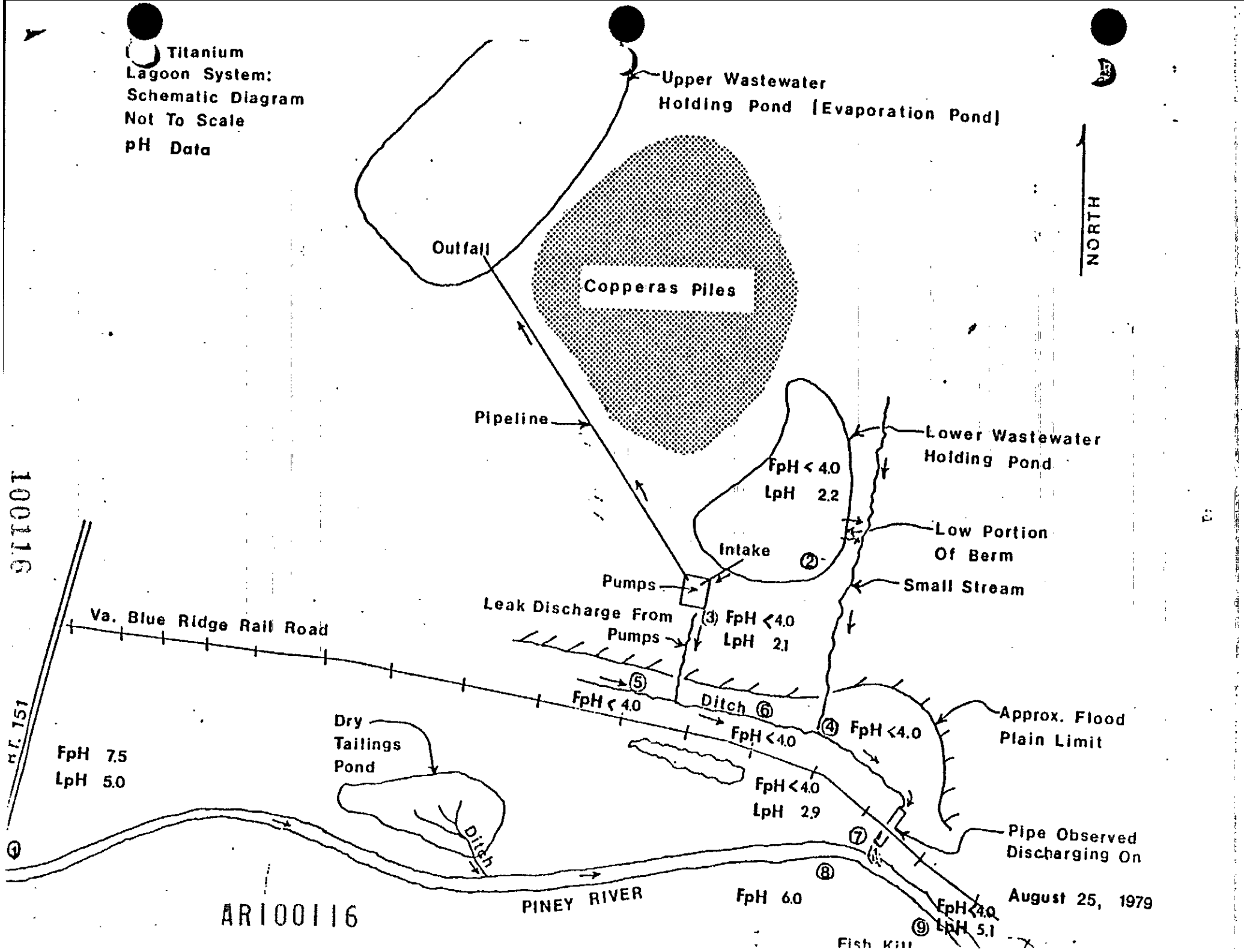
100113

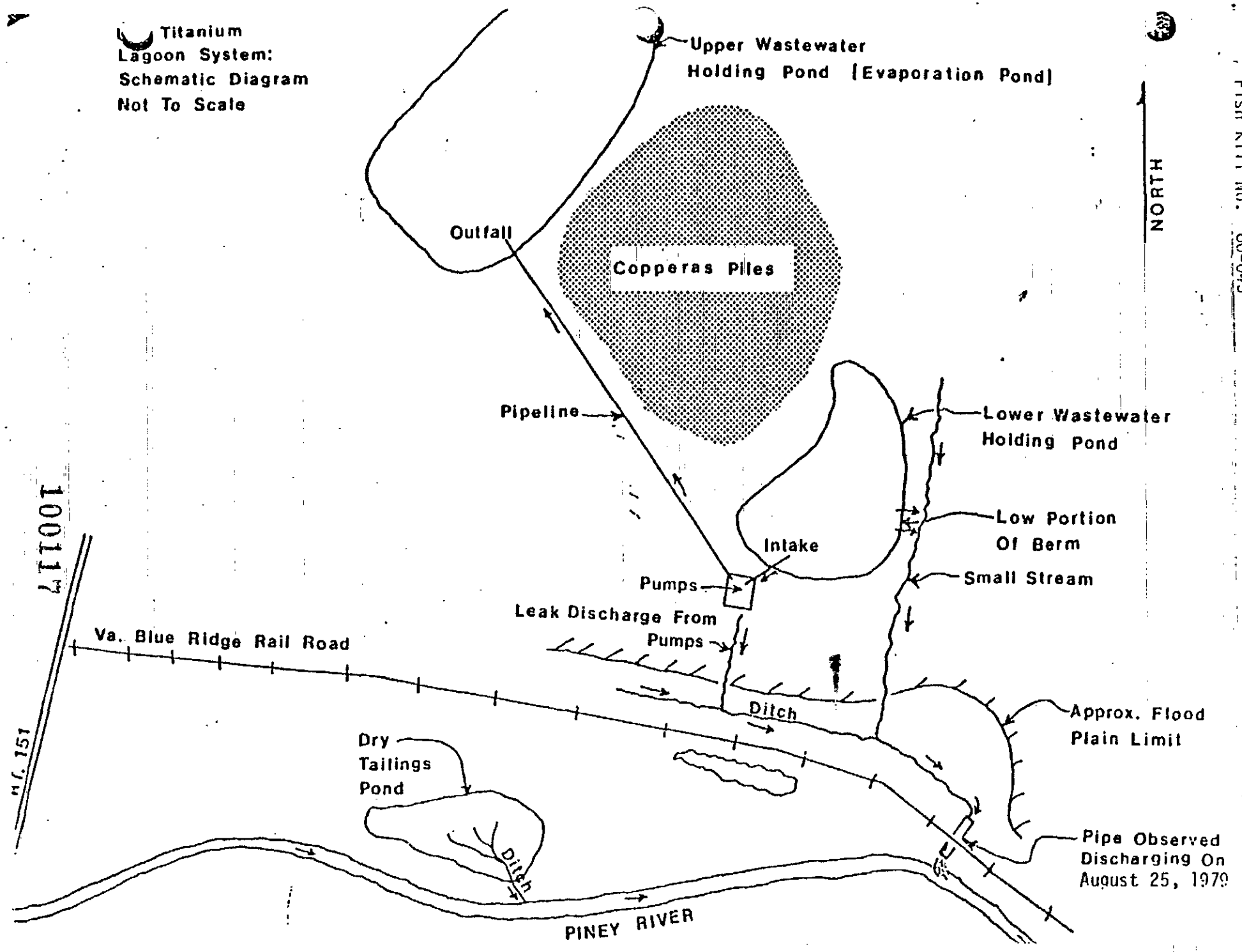
FK 80-043



ARRINGTON QUAD
100114

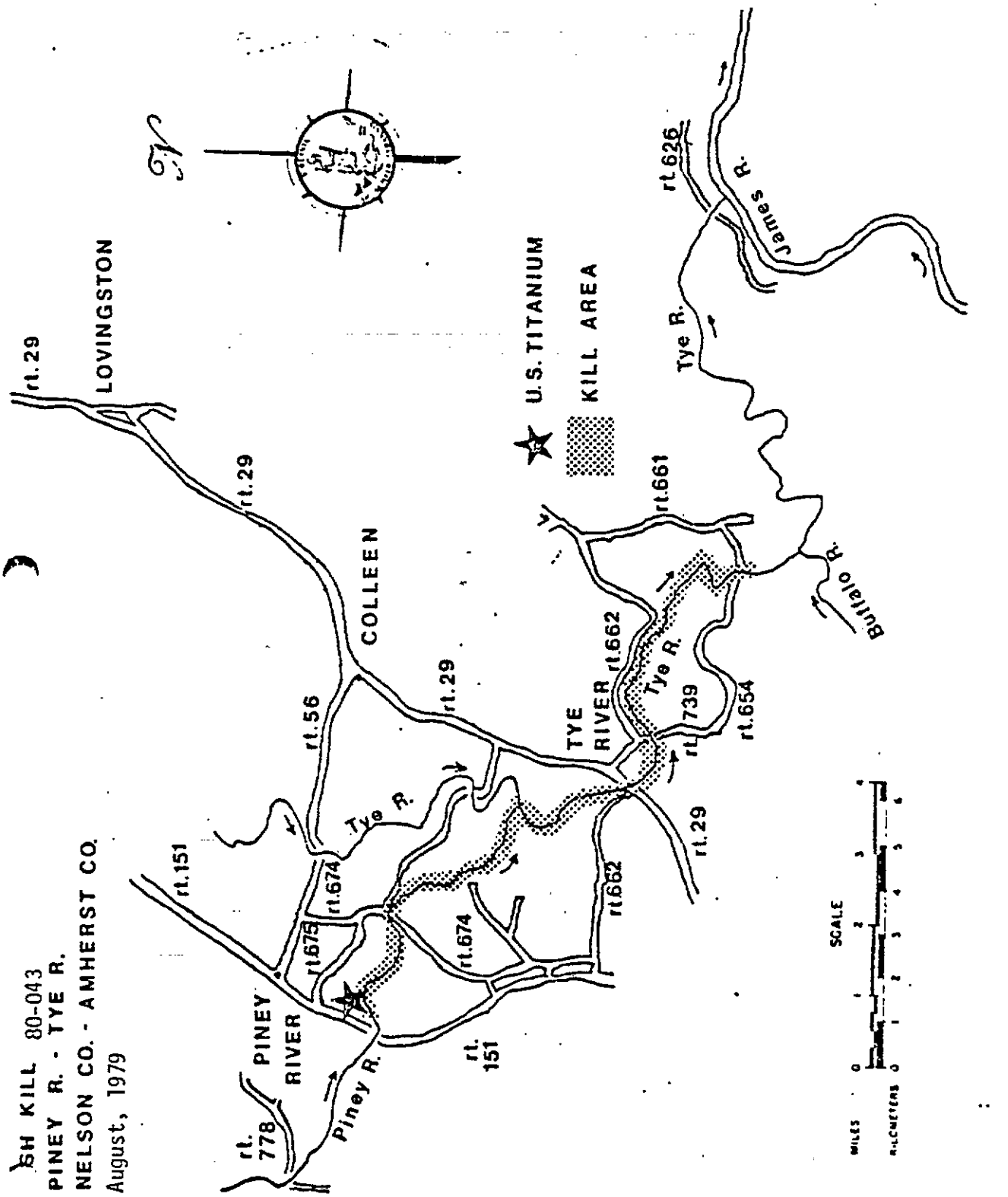



Titanium
Lagoon System:
Schematic Diagram
Not To Scale
pH Data
Upper Wastewater
Holding Pond (Evaporation Pond)
NORTH
Outfall
Copperas Piles
Pipeline
Lower Wastewater
Holding Pond
FpH < 4.0
LpH 2.2
Low Portion
Of Berm
Intake
②
Pumps
Small Stream
Leak Discharge From
Pumps
③ FpH < 4.0
LpH 2.1
Va. Blue Ridge Rail Road
⑤
FpH < 4.0
Ditch ⑥
Dry
Tailings
Pond
④ FpH < 4.0
Approx. Flood
Plain Limit
FpH < 4.0
FpH 7.5
LpH 5.0
FpH < 4.0
LpH 2.9
Rt. 151
Ditch
⑦
Pipe Observed
Discharging On
August 25, 1979
⑧
PINEY RIVER
FpH 6.0
FpH < 4.0
⑨ LpH 5.1
Fish kill
911001
AR100116



Fish Kill No. 80-043

Fish Kill No. 80-043



SH KILL 80-043
PINEY R. - TYE R.
NELSON CO. - AMHERST CO.
August, 1979

100118

Fish Kill No. 80-043

4.0 VISUAL OBSERVATIONS:

4.1 WATER:

Station	D.O. mg/l	pH	Temp. (°F)	Dead Fish ?	Color	Turbidity
1		7.5	78	None (control)	Clear	
2		<4.0		N/A (drainage area)	Dark red	
3		<4.0		" "	"	
4		<4.0		" "	Reddish	
5		<4.0		" "	"	
6		<4.0		" "	"	
7		<4.0		" "	"	
8		6.0	80	None (discharge)	Clear	
9		<4.0		Few minnows	"	
10		4.6		None sighted	Brown	Opaque

Station	Floating Solids	Surface Film	Flow	Tide Stage	Odor (def)	Other
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

100119

Fish Kill No. 80-043

4.2 FISH:

GENERAL APPEARANCE:

nervous, scary_____
sinking to bottom_____
gasping at surface_____
unusual color_____
frantic_____
sluggish_____
spiraling_____
flashing_____
rubbing against bottom_____
able to avoid capture_____
floating listlessly_____
swimming upside down_____
other All dead

ARRANGEMENT IN WATER:

normal distribution all
moving into other water sources_____
floating towards outlet_____
attempting to leave water_____
schooling_____
near surface_____
crowding water inlet_____
other_____

BODY SURFACE: *

normal all light & dark patches_____ bleached_____ bloated_____
bluish film: in patches_____ or all over_____
grayish-white: in patches_____ or tufts_____
deep open lesions with pus and blood_____
swollen areas as furuncles_____
shallow red ulcers: small_____ or large_____
body splitting open along midline_____
muscous on skin_____
other_____

FINS: *

normal all
swollen_____
necrotic_____
frayed_____
bluish white_____
parasite present_____
twisted_____
eroded_____
spots present: white_____
black_____
blood-shot_____
other:_____

CAUDAL PEDUNCLE: *

slightly swollen_____
very swollen_____
necrotic_____
inflamed_____
bluish-white_____
fungus-like tufts_____
other_____

GILLS: *

gill color: bright red_____ red____ pink____ white_____
gill cover widely expanded_____
swollen_____
covered with mucus, food and dirt particles_____
patches: white_____ brown_____ gray_____
other_____

100120

* Indicate approximate number of fish having these characteristics. Look for general trends, not specific fish (few, many, all, none).

Fish Kill No. 80-043

EYES: *

normal all	bulging
opaque	one eye missing
white: lens or center	both eyes missing
tiny spots in lens	if a needle is inserted in the eye socket
red spots in cornea	and the eye is pressed while fish head is
popeye	under water, gas bubbles or opaque
other	fluid escapes.

* Indicate approximate number of fish having these characteristics. Look for general trends, not specific fish. (few, many, all, none)

OTHER CONDITIONS OR SYMPTOMS NOTED:

Partly eaten remains found on shore and exposed rocks.

5.0 SAMPLES AND ANALYSES:

5.1 CHEMICAL SAMPLES COLLECTED:
(circle samples not collected by State Water Control Board)

source (pollution) 2	polluted area
source (oil)	spill area
1/2 gallon glass	quart plastic 4
gallon plastic 3	quart glass
mercury bottles	mud
	soil

5.2 BIOLOGICAL SAMPLES COLLECTED: *
(circle samples not collected by State Water Control Board)
Fish must be properly identified to genus on lab sheet

fish	benthic
oyster	clam
crab	mussel
other	other

* Specify whole fish, edible meat or organs to be analized

100121

Fish Kill No. 80-043

5.1 CHEMICAL ANALYSIS
check box for requested analysis

	Station	1	2	3	7
	Date	8-25-79	8-25-79	8-25-79	8-25-79
	Time	1655	1730	1725	1750
	Lab Number	L-169	L-171	L-170	L-172
	Parameter				
☐	BOD_5, mg/l				
☐	MPN / 100 ml				
XX	pH (laboratory)	5.0	2.2	2.1	2.9
☐	Acidity (total) mg/l	21	31050	18850	730
☐	Alkalinity (total), mg/l	7	Acid	Acid	Acid
☐	Path Alkalinity, mg/l				
☐	Settleable Solids, mg/l				
☐	Total Solids - Tot, mg/l				
	Vol, mg/l				
	Fix, mg/l				
☐	Susp. Solids- Tot, mg/l				
	Vol, mg/l				
	Fix, mg/l				
☐	Chlorides, mg/l as Cl				
☐	Tot Kit, Kjel, mg/l as N				
☐	Ammonia, mg/l as N				
☐	Nitrite, mg/l as N				
☐	Nitrate, mg/l as N				
☐	Hydrol. Phosphates, mg/l as P				
☐	Ortho Phosphates, mg/l as P				
☐	Total Phosphates, mg/l as P				
☐	Chromium Tot, mg/l				
☐	Zinc, mg/l				
☐	Lead, mg/l				
XX	Iron, mg/l				73
☐	Copper, mg/l				
☐	Manganese, mg/l				
☐	Hexane Extractables, mg/l				
☐	Chemical Oxygen Demand, mg/l				
☐	Oils by Infrared, mg/l				
☐	Sulfate	6	32,240	20,410	1580
☐					
☐					
☐					
☐					

100122

Fish Kill No.: 80-043

5.1 CHEMICAL ANALYSIS
check box for requested analysis

	Station	8	9	10	
	Date	8-25-79	8-25-79	8-25-79	
	Time	1800	1805	1930	
	Lab Number	L-173	L-174	L-175	
	Parameter				
☐	BOD_5, mg/l				
☐	MPN / 100 ml				
☒	pH (laboratory		5.1	4.6	
☐	Acidity (total) mg/l	3	4	15	
☐	Alkalinity (total), mg/l	3	4	2	
☐	Path Alkalinity, mg/l				
☐	Settleable Solids, mg/l				
☐	Total Solids - Tot, mg/l				
	Vol, mg/l				
	Fix, mg/l				
☐	Susp. Solids- Tot, mg/l				
	Vol, mg/l				
	Fix, mg/l				
☐	Chlorides, mg/l as Cl				
☐	Tot Nit, Kjel, mg/l as N				
☐	Ammonia, mg/l as N				
☐	Nitrite, mg/l as N				
☐	Nitrate, mg/l as N				
☐	Hydrol. Phosphates, mg/l as P				
☐	Ortho Phosphates, mg/l as P				
☐	Total Phosphates, mg/l as P				
☐	Chromium Tot, mg/l				
☐	Zinc, mg/l				
☐	Lead, mg/l				
☒	Iron, mg/l	1.5	2.9		
☐	Copper, mg/l				
☐	Manganese, mg/l				
☐	Benzene Extractables, mg/l				
☐	Chemical Oxygen Demand, mg/l				
☐	Oils by Infrared, mg/l				
☒	Sulphate	20	270	35	
☐					
☐					
☐					
☐					
☐					

100123

Fish Kill No. 80-043

6.0 TOXICITY OF ELEMENTS INVOLVED AS REPORTED IN LATEST LITERATURE:

REFERENCE: See attached report.

REMARKS: US Titanium holds a no discharge permit. The pH levels in the runoff (discharge) pipe indicate a violation of this permit. Also, these levels are well below the State Water Quality Standard for pH in state waters. It is believed that these extreme pH readings were the cause of FK 80-034. As documented in the literature pH values much below 5.0 can be acutely toxic to several species of fish. Several pH samples taken at various stations in the US Titanium drainage area and the Piney River indicated lowered pH values that would be lethal to fish on short term exposure. The pH readings taken several hundred yards above the US Titanium discharge pipe were recorded as 7.5 and 5.0 in the lab. This lowered to 6.0 several feet above the discharge. The discharge itself was recorded as $\leq$4.0 in the field and 2.9 in the lab. Below the discharge investigators also recorded $\leq$4.0 in the field, while lab pH values were 5.1 (see attached map).

In conversations with DCLS it was found that the age of the water samples (approx. 4 days) could significantly alter laboratory pH reading. It was recommended that the most reliable readings of pH would be those taken in the field. Thus, the field pH readings indicate a severe pH problem at the time of investigation.

7.0 BENTHIC, ALGAL EXAMINATION (CURSORY):

Station	Substrate	Aquatic plants	Algae	Benthic animals	Tolerance %			How compar with contr
					Tol	Fac	Sensit	
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Fish Kill No. 80-043

6.0 Toxicity of Elements Involved as Reported in the Latest Literature:

A. Chemistry

Copperas is ferrous sulfate, $FeSO_4 \cdot 7H_2O$. In the presense of oxygen and water, ferrous sulfate is oxidized to form sulfuric acid and other by-products as shown below:

(1) $12\ FeSO_4 + 3\ O_2 + 6\ H_2O \rightarrow 4\ Fe_2(SO_4)_3 + Fe(OH)_3$

copperas — oxygen — water — ferric sulfate — ferric hydroxide

(2) $Fe_2(SO_4)_3 + 6\ H_2O \rightarrow Fe(OH)_3 + 3H_2SO_4$

ferric sulfate — water — ferric hydroxide — sulfuric acid

(Herricks and Cairns, n.d.; Yeasted and Shane, 1976)

The sulfuric acid produced was responsible for the low pH of the runoff from the copperas piles. Our laboratory results showed that high concentrations of iron and sulfate, Fe^{+2} and SO_4^{-2}, were also present in solution in the runoff water, due to dissociation of the water-soluble reactants and products.

B. Effects of Low pH on Fish.

Acceptable pH levels for fish are determined in part by such accompanying conditions as temperature, dissolved oxygen, and the type and amount of other ions present (McKee and Wolf, 1963). Acceptable values cited in the literature vary considerably, not only from one species of fish to another, but also from investigator to investigator.

Generally, pH levels must be below 5.0 to be lethal, with mortalities progressively increasing below this level (Doudoroff and Katz, 1953). Behavorial and physiological signs of stress begin to appear in the range pH 5.8 to pH 5.0 (Falk and Dunson, 1977). The range pH 5.0 to pH 4.0 is the lower lethal limit for most fish studied, while no references could be found for survival below pH 3.3.

Most of the pH-lethality literature deals with brook trout; typical survival times for that species are as follows:

pH	Survival time for trout	
4.2	up to 88% survival for 5 days	(Dively et al., 1977)
3.5	32 hours (average)	(Falk and Dunson, 1977)
3.5	3 days (max.)	(Robinson et al., 1976)
3.25	2 days ("extremely tolerant" fish)	
	1 day (avg.)	(Robinson et al., 1976)
3.15	11.2 hours (min, after acclim.)	(Falk and Dunson, 1977)
	28.3 hours (max, after acclim.)	

Fish Kill No. 80-043

For other species, the following table provides general information (McKee and Wolf, 1963):

pH

4.6 lower limit for perch

4.3 Killed carp in 5 days

4.0 lower limit for bluegill in HCl

3.6 96-hr. TL_m for bluegill

3.3 trout survived without adverse effects (time unspecified)

Fish Kill No. 80-043

REFERENCE: Daye, P. G., and E. T. Garside. 1976. Histopatholic changes in Surficial Tissues of Brook Trout, Savelinus fontinalis (Mitchill), Exposed to Acute and Chronic Levels of pH. Canadian Jour. of Zoology, Vol. 54, No. 12, pp. 2140-2155.

REFERENCE: Dively, J., J. Mudge, W. Neff, and A. Anthony. 1977. "Blood PO_2, PCO_2 and pH Changes in Brook Trout (Salvelinus fontinalis) Exposed to Sublethal Levels of Acidity," Comp. Biochem. Physiol., Vol. 57A, pp. 347-351.

REFERENCE: Doudoroff, P. and M. Katz. n.d. "A Summary of Literature on Toxicity of Alkalies, Acids, and Inorganic Gases to Fish."

REFERENCE: Echave, H.S. 1954. Studies of Tolerance of Fresh Water Fish to Strong Acids and Acid Mine Wastes. Master's Thesis in Sanitary Engineering, The John Hopkins University, 1954. In: C. E. Renn, H. H. Hobbs, Jr. and B. F. D. Runk. 1955. Biological Survey of the Piney River, Va. and Evaluation of Effects of Water-Borne Wastes. Report to American Cyanamide Co. (unpublished).

REFERENCE: Falk, D. L. and M. A. Duncan. 1977. Water Research. Vol. 11, pp. 13-15.

REFERENCE: Herricks, E. E. and John Cairns, Jr. n.d. Bulletin 66: Rehabilitation of Streams Receiving Acid Mine Drainage, Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University (Blacksburg).

REFERENCE: McKee, J. E. and H. W. Wolf (eds.). 1963. Water Quality Criteria, Second Edition. California State Water Resources Control Board.

REFERENCE: Robinson, G., W. Duncan and G. Mamolitol 1976. Differences in Low pH Tolerance Among Strains of Brook Trout (Savelinus fontinalis). Jour. Fish Bio. Vol. 8, No.1, p. 5 ff.

REFERENCE: United States Environmental Protection Agency. 1976. Water Quality Criteria for Water. U.S. EPA, Washington, D. C. 20460.

REFERENCE: Yeasted, J. and R. Shane. 1976. pH Profiles in a River System with Multiple Acid Loads. Jour. Water Pol. Cont. Fed., Vol. 48, No. 1, p. 91.

Fish Kill No. 80-043

8.0 ROUGH FIGURES FOR FISH COUNT:

8.1 Lake, pond or river; total count of every fish: _____

OR

8.2 100 yard segment/half mile area count; lake or river: _____

Total distance of kill in stream/~~xxxx~~ miles/~~xxxxx~~: 12

Segment	Species, No. size	Species, No., size	Species, No., Size
(1st. fish seen)			
1st. 100 yds.	Minnows 6 all		
2nd. 100 yds.	Sunfish 2 4		
	" 2 5		
	" 1 7		
	Sucker 1 10		
3rd. 100 yds.	None		
4th. 100 yds.	None		
5th. 100 yds.	None		
6th. 100 yds.	None		
7th. 100 yds.	Minnows 154 all	Suckers 14 7-8	SM Bass 13 1-4
	Suckers 13 1-2	12 9-12	4 5-7
	36 3-4	Sunfish 3 1-3	3 10
	24 5-6	2 5	Channel Cat 6 1-3
8th. 100 yds.	Minnows 449 all	Suckers 3 18-20	Sunfish 2 2
SM Bass 4 2-3	Suckers 46 2-4	Chubs 9 2-3	" 3 5-6
SM Bass 4 6-7	" 22 5-8	" 40 4-5	
" 2 12	" 11 10-15	" 24 6-8	
9th. 100 yds.	Minnows 183 all	Suckers 10 15-20	Chubs 24 6-8
	Suckers 4 3-5	SM Bass 2 3-5	" 7 9-14
	" 15 6-8	" 1 9	Carp sucker 2 6-7
	" 12 9-12	Chubs 15 1-5	2 9

100128

Fish Kill No. 80-043

Segment	Species,	No.,	Size	Species,	No.,	Size	Species,	No.,	size
10th. 100 yds.	Minnows	85	all	Suckers	18	10-15	Chubs	2	5"
	Darters	2	all	SM Bass	5	2-5	Carp sucker	1	6"
	Suckers	9	2-6	"	3	6-10			
	"	10	7-9	Chubs	4	2-4			
11th. 100 yds.									
	NOT COUNTED								
12th. 100 yds.	Minnows	110	all	SM Bass	7	2-4	Channel Catfish	1	5
	Suckers	12	5-8	Chub	5	3-5			
	"	15	9-13	"	1	9			
	Sunfish	1	5"	Carp sucker	2	5-7			
13th. 100 yds.									
14th. 100 yds.									
15th. 100 yds.									

Calculated Total Length - 12 miles (21,120 yards)

Expansion factor $\frac{21120 \text{ yards}}{1200 \text{ yds counted}} = 17.6$

Total number fish counted - 1,485

1485 X 17.6 = 26,136 fish killed

(See attached fish cost sheet)

Sample calculations:

Calculated total length of kill - 21,120 yards

Expansion factor $\frac{21,120 \text{ yards}}{1,200 \text{ yards counted}} = 17.6$

Darters counted = 2

2 X 17.6 = 35.2

35 Darters

100129

Fish Kill No. 80-043

9.0 COST:

Cost of investigation: Bureau of Surveillance and Field Studies, Individual sheets: 1145.54 Enforcement _____
Other: _____
Cost of freshwater fish (Commission of Game and Inland Fisheries): $ 2,107.16
Cost of marine fish: _____
Other cost (explain): Lab cost $ 19.15; Administrative cost $ 25.00
Total cost to State of Virginia: $ 3,296.85

Copies: Director BSFS, Regional Office, Enforcement, DES File (orig.), Commission of Game and Inland Fisheries, Investigator, HATS File

Report completed and distribution made: _____ (signed) _____ (date)

Enclosures:

MISC. NOTES:

The Board has received reports of, and made investigations of, five fish kills on the Piney and Tye Rivers in the 1970's prior to 80-043. The first report, 71-049 was received in August 1971, and although no fish were found, the stream pH was less than 4.0. No additional reports were received until late summer 1976, when 3 reports were received within a six week period (77-013, 77-036 and 77-056). Only 20 to 30 badly decomposed fish were found during the first investigation on July 14, 1976. No dead fish were found during the investigation of 77-306 two weeks later. No fish were found during the investigation of 77-056 on September 2, 1976, but a break in the berm of the lower lagoon was discovered and the leak was reaching the stream, turning it red below the discharge and lowering its pH to 4.5. On July 11, 1977 the staff investigated FK 78-011. pH levels in the stream were reported to be lethal to fish and a count of the area revealed 73,056 dead fish. US Titanium admitted fault in the kill and paid for these fish as well as cost of the investigation. This kill was remarkably similar to FK 80-043.

VIRGINIA STATE WATER CONTROL BOARD
Fish Kill Investigation No 80-043
Total Costs Summary

Itemized below are expenses incurred by the Virginia State Water Control Board during the subject fish kill investigation.

Number of personnel involved in investigation: 8

Total man-hours in field and report preparation: 123.5

Total man-hours in laboratory: _____

Total wage expense based on hourly rate for all participants: 986.92

Total wage expense for laboratory: (lab costs) 19.15

Total number of miles driven by State car: 714

Total mileage expense for use of State car (~~XX~~ 15 cents/mile) 102.30

Total number of miles driven by private car: _____

Total mileage expense for use of private car (10 cents/mile) ..... _____

Total expense for travel by train, plane or bus: ..... _____

Rates for boat use:	Daily cost	Hourly operating cost	
Canoe	6.25	$2.00	(4 hp)
Flatbottom	6.25	2.50	(7.5, 9.8 hp.)
Large Flatbottom	10.00	3.50	(20 hp.)
Glassmaster 17'	15.00	5.00	
Carousel, I-Craft,	31.65	6.50	
Glassmaster 19'	31.65	6.50	
Other			

Number of days boat was used: _____
Number of hours boat was used: _____

Total expense for Boat use: ..... _____

Total number of nights spent in field for all participants: _____

Total expense for lodging: ..... _____

Total number of meals for all participants: 14

Total expense for meals: 41.62

Miscellaneous items (ice, tolls, film, etc.) include item, quantity, and cost:
2 rolls film & processing - tolls
Total expenses for miscellaneous items: 14.70

Bioassay Costs ..... _____

Administrative costs 25.00

TOTAL EXPENSES 1189.69

Signed by Brenda H. Tracy

Date 12/1/79

100131

Form IG-74

Tye River
Nelson County

Sheet No. 1

REPLACEMENT COST OF FISH

Fish Kill No. 80-043

Species & Common Name	Size (Inches)	Number	Individual Value	Total Value
Lepomis - sunfish	2	53	.17	9.01
	3	35	.23	8.05
	4	35	.29	10.15
	5	123	.40	42.90
	6	18	.68	12.24
	7	18	1.14	20.52
Channel Catfish				
Ictalurus punctatus	1	18	.02	.36
	2	35	.03	1.05
	3	53	.05	2.65
	6	18	.11	1.98
Carpiodes carpio				
Carpsucker	5	35	.05	1.75
	6	35	.05	1.75
	7	35	.07	2.45
	9	35	.09	3.15

Sub-total $118.01

Grand Total _____ _____

Signed: [signature]
(Chief, Fish Division, CGIF)

Date: September 5, 1979

100132 Form 36-75

REPLACEMENT COST OF FISH

Fish Kill No. 80-043

Species & Common Name	Size (Inches)	Number	Individual Value	Total Value
Percina - Darters		35	.11	3.85
Catostomus commersoni -				
white sucker	1	35	.06	2.10
	2	246	.06	14.76
	3	1056	.06	63.36
	4	370	.11	40.70
	5	334	.11	36.74
	6	405	.11	44.55
	7	282	.17	47.94
	8	246	.17	41.82
	9	158	.23	36.34
	10	229	.23	52.67
	11	70	.29	20.30
	12	106	.34	36.04
	13	35	.34	11.90
	14	18	.34	6.12
	15	158	.34	53.72
	16	18	.34	6.12
	18	18	.34	6.12
	20	70	.34	23.80

Sub-total $548.95

Grand Total _____ _____

Signed: _____

(Chief, Fish Division, CGIF)

Date: September 5, 1979

100133 Form 36-75

REPLACEMENT COST OF FISH

Fish Kill No. 80-043

Species & Common Name	Size (Inches)	Number	Individual Value	Total Value
Hypentelium nigricans -				
Northern Hogsucker	4	35	.11	3.85
	5	123	.11	13.53
	6	141	.11	15.51
	7	158	.17	26.86
	8	123	.17	20.91
	9	123	.23	28.29
	10	229	.23	52.67
	11	106	.29	30.74
	12	106	.34	36.04
	15	53	.34	18.02
	20	18	.34	6.12
Cyprinidae				
minnows		17,371	.03	521.13

Sub-total

Grand Total $773.67

Signed: _____

(Chief, Fish Division, CGIF)

Date: September 5, 1979

100134

Form 36-75

REPLACEMENT COST OF FISH

Fish Kill No. 80-043

Species & Common Name	Size (Inches)	Number	Individual Value	Total Value
Micropterus dolomieui -	1	18	.11	1.98
Smallmouth bass	2	229	.17	38.93
	3	176	.23	40.48
	4	88	.29	25.52
	5	70	.40	28.00
	6	70	.68	47.60
	7	70	1.14	79.80
	9	18	1.99	35.82
	10	70	2.85	199.50
	12	35	2.85	99.75
Semotilus - chub	2	88	.03	2.64
	3	176	.03	5.28
	4	475	.03	14.25
	5	581	.03	17.43
	6	317	.03	9.51
	7	158	.03	4.74
	8	370	.03	11.10
	9	70	.03	2.10
	12	35	.03	1.05
	14	35	.03	1.05

Sub-total $666.53

Grand Total $2,107.16

Signed: [signature]
(Chief, Fish Division, CGIF)

Date: September 5, 1979

100135 Form 36-75

LABORATORY COSTS

Fish Kill No. 80-043

	PARAMETER	no. of analyses	cost per analysis	total cost		PARAMETER	no of analyses	cost per analysis	total cost
	Coliform, Total /100 ml					Arsenic			
	Coliform, Fecal /100 ml					Cadmium			
X	pH (Laboratory)	7	1.00	7.00		Calcium			
X	Alkalinity	7				Chromium			
	Total Solids, Total					Copper			
	Volatile				X	Iron	3	.55	1.65
	Fixed					Lead			
	Suspended Solids, Total					Magnesium			
	Volatile					Manganese			
	Fixed					Mercury			
	Dissolved Solids					Zinc			
	Chloride								
	Hardness								
	Nitrogen, Total Kjeldahl								
	Phosphorus, Total								
	Phosphorus, Ortho								
	Ammonia mg/l as N					Turbidity			
	Nitrite mg/L as N					Pesticides			
	Nitrate mg/L as N					Settleable Solids			
X	Sulphate	7	1.50	10.50		Conductivity			
	Hexane Extractables								
	BOD5								
	COD								

Effective date October 2, 1979

Grand Total $ 19.15

Approved by _____
(Authorized Signature)

100136

FISH KILL REPORT/NOTIFICATION

Fish Kill Number 80-043 City/County Nelson

Stream Piney River/Tye River Date Investigated 8/25/79

Basin James Investigator L. M. Simmons
R. W. Bolgiano

Region VRO

Reported by: Name Mr. Pete Archbell

Address

Phone (703) 277-8515

Reported to: Name Amherst County Game Warden

Fish Killed (common name) Refer to DES Report Date Kill Started

Number Killed Date Kill Ended

Length/area Involved Total Cost Investigation

Cause of Kill Man Hours

Exact Location of Kill

Other:

Date 27 August 1979 Investigators Signature [signature]

Recommendations:

Division of Ecological Studies

Date Signature

Enforcement:

Date Signature

Fish Kill Distributed (Date)

7 Copies: DES, BSES Dir., Enf., Region, CGIF, HATS File, Fish Kill File (Cent)

100137

Form ...

SPILLS AND FISH KILLS

DISTRIBUTION: R.V. DAVIS, A.H. PAESSLER, M.A. BELLANCA, R.E. BOWLES, D.F. JONES, D.S. R
I.G. LAWSON, R.L. HILL, A.L. WILLETT, R.S. MCIVOR, J.P. GODFREY, T.M. FE
D.L. JOHNSON, P.J. MASON (DCLS), C. FITZ-WILLIAM (DCLS), C.W. WILEY (SDH
REGIONAL OFFICES: NRO, PRO, SWRO, TRO, WCRO, VRO, KILMARNOCK.

CUMULATIVE DATA DATE: August 27, 1979

REPORTING PERIOD	OIL SPILLS		HAZARDOUS CHEMICAL SPILLS		FISH KI	
	NO.	GALS.	NO.	GALS.	NO.	COUNT I
August 21, 25, and 26	-	-	-	-	1	-
August	28	12,720	-	-	17	17.0
TOTAL CY 1979	249	74,912	15	2,770	99	45.1

DATE: AUGUST 24, 1979 PROP LOG

0840 PS0-160 — Southwest Region: Charles Nutter, Tazewell County Sanitarian forwarded a compliant from Mrs Dye, Tazewell, of sawdust enterin an unnamed tributary to Jacob's Branch. H. Puckett to investigate

1450 PS0-161 — Southwest Region: Alice Warren, SWRO, relayed a report from Bill Osborne, Washington County, of a contaminated spring belongi to Robert Mabe. The source of the pollution is believed to be runoff from a hog lost owned by Roy McNew. A Warren to investiga

1655 PS0-162 — West Central Region: John Dike, Plant Supervisor-upper Smith Riv Waste Water Plant, reported a sewage discharge at the plant. J. Quiesser to investigate.

2030 PS0-163 FKS0-043 — WEST CENTRAL REGION: Pete Archbell, Amherst County, reported a f kill in Amherst County. N. Obenshain to investigate.

2500 PS0-165 FKS0-045 — VALLEY REGION: N. Obenshain (PCRO) reported that the fish kill w in the Valley Region. Fish are reported dead in the Tye and Piney Rivers below U.S. Titanium. L. Simmons to investigate.

2350 PS0-165 FKS0-045 — VALLEY REGION: Dave Pavlor, DES, notified of kill and possibility headquarters response.

2400 PS0-165 FKS0-045 — VALLEY REGION: R. Bolgiano (VRO) advised of kill.

L-169

Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

1 gt cube

FIELD AND LABORATORY DATA

LG CD

JON FK SS PC BM PS BIO GW: [ ][X][ ][ ][ ][ ][ ][ ]

LATITUDE

FK, SS, PC, PS, BM, OR BIO NO.: 80-043

LONGITUDE

BASIN STREAM RIVER MILE

LABORATORY NUMBER DEPTH SECTION REGION

MONTH DAY YEAR: 08 25 79

TIME: 1655

SOURCE

TIDE % FLB FLOW CFS WEATHER TEMP. °F: 078

DISSOLVED OXYGEN DO% SAT FIELD pH: 06 7 5 0

Collect for: DES

Collected by: Treacy

Name of Stream: Piney R.

Station Description: above UST to at Rt 151 Bridge

RECEIVED
AUG 27 1979
DIV. CON. LAB. SERV.
ENVIRONMENTAL LAB

PARAMETER	STATE CODE	VALUE	PARAMETER	STATE CODE	VALUE
Coliform, Total /100 ml	020		Arsenic	058	
Coliform, Fecal /100 ml	055		Cadmium	078	
pH (Laboratory)	050	5.0	Calcium	052	
Alkalinity / Acidity	022	7/21	Chromium	040	
Total Solids, Total	024		Copper	045	
Volatile	025		Iron	044	
Fixed	026		Lead	043	
Suspended Solids, Total	027		Magnesium	246	
Volatile	028		Manganese	096	
Fixed	029		Mercury	090	
Dissolved Solids Total	067		Zinc	041	
Chloride	033				
Hardness	032				
Nitrogen, Total Kjeldahl	035				
Phosphorus, Total	065				
Phosphorus, Ortho	064				
Ammonia mg/l as N	036		Turbidity	049	
Nitrite mg/L as N	037		Pesticides	121, 122	
Nitrate mg/L as N	038		Settleable Solids	023	
Sulphate	107	6	Conductivity	034	
Hexane Extractables	048				
BODs	019				
COD	051				

Date released from Lab: AUG 29 1979

Chemist: S. R. Pitts Jr

100139

Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

1 qt. cube

FIELD AND LABORATORY DATA

LG CO.

VON FK SS PC BM PS BIO GW

LATITUDE

FK, SS, PC, PS, BM, OR BIO NO. 80-043

LONGITUDE

Collect for: DES

Collected by: Treacy

Name of Stream Piney R.

Station Description Pool in gully below pump house @ U.S Titanium, lower lagoon pH less than 7.0

BASIN STREAM RIVER MILE

LABORATORY NUMBER DEPTH SECTION REGION

MONTH DAY YEAR TIME SOURCE

0 8 2 5 7 9 1 7 2 5

TIDE % FLB FLOW CFS WEATHER TEMP. °F

DISSOLVED OXYGEN DO% SAT FIELD pH

RECEIVED
AUG 27 1979
DIV. CONT. LAB. SERV.
ENVIRONMENTAL LAB.

PARAMETER	STATE CODE	VALUE	PARAMETER	STATE CODE	VALUE
Coliform, Total /100 ml	020		Arsenic	058	
Coliform, Fecal /100 ml	055		Cadmium	078	
pH (Laboratory)	050	3.1	Calcium	052	
Alkalinity / Acidity	022	Acid/1250	Chromium	040	
Total Solids, Total	024		Copper	045	
Volatile	025		Iron	044	
Fixed	026		Lead	043	
Suspended Solids, Total	027		Magnesium	246	
Volatile	028		Manganese	096	
Fixed	029		Mercury	080	
Dissolved Solids Total	067		Zinc	041	
Chloride	033				
Hardness	032				
Nitrogen, Total Kjeldahl	035				
Phosphorus, Total	065				
Phosphorus, Ortho	064				
Ammonia mg/l as N	036		Turbidity	049	
Nitrite mg/L as N	037		Pesticides	121, 122	
Nitrate mg/L as N	038		Settleable Solids	023	
Sulphate	107	20,410	Conductivity	034	
Hexane Extractables	048				
BODs	019				
COD	051				

Date released from Lab: AUG 29 1979 Chemist: S. R. Peterson Jr. 100140

L-17

Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

1 pt cube

FIELD AND LABORATORY DATA

LA CD

JON FK SS PC BM PS BIO GW: X

LATITUDE

FK, SS, PC, PS, BM, OR BIO NO.: 80-043

LONGITUDE

BASIN | STREAM | RIVER MILE

LABORATORY NUMBER | DEPTH | SECTION | REGION

MONTH: 08 | DAY: 25 | YEAR: 79 | TIME: 1730 | SOURCE

TIDE | % FLB | FLOW CFS | WEATHER | TEMP. °F

DISSOLVED OXYGEN | DO% SAT | FIELD pH

Collect for: DES

Collected by: Treacy

Name of Stream: Piney River

Station Description: U.S. Titanium lower lagoon pH less than 4.0

RECEIVED
AUG 27 1979
DIV. CO... ...S. SERV.
ENVIRONMENTAL LAB

PARAMETER	STATE CODE	VALUE	PARAMETER	STATE CODE	VALU
Coliform, Total /100 ml	020		Arsenic	058	
Coliform, Fecal /100 ml	055		Cadmium	078	
pH (Laboratory)	030	2.2	Calcium	052	
Alkalinity / Acidity	022	Acid / 31050	Chromium	040	
Total Solids, Total	024		Copper	045	
Volatile	025		Iron	044	
Fixed	026		Lead	043	
Suspended Solids, Total	027		Magnesium	246	
Volatile	028		Manganese	096	
Fixed	029		Mercury	080	
Dissolved Solids Total	067		Zinc	041	
Chloride	033				
Hardness	032				
Nitrogen, Total Kjeldahl	035				
Phosphorus, Total	065				
Phosphorus, Ortho	064				
Ammonia mg/l as N	036		Turbidity	049	
Nitrite, mg/L as N	037		Pesticides	121, 122	
Nitrate mg/L as N	038		Settleable Solids	023	
Sulphate	107	32,240	Conductivity	034	
Hexane Extractables	048				
BOD5	019				
COD	051				

Date released from Lab: AUG 29 1979

Chemist: S. R. Peterson Jr.

100141

Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

1 gallon cubs

FIELD AND LABORATORY DATA

LG CD

MON FK SS PC BM PS BIO GW

LATITUDE

FK, SS, PC, PS, BM, OR BIO NO.

80-043

LONGITUDE

Collect for: DES

Collected by: Treacy

Name of Stream Piney River

Station Description U.S. Route 60 Discharge from drainage area into Piney River

BASIN STREAM RIVER MILE

LABORATORY NUMBER DEPTH SECTION REGION

MONTH DAY YEAR TIME SOURCE

08 25 79 1750

TIDE % FLB FLOW CFS WEATHER TEMP. °F

DISSOLVED OXYGEN DO% SAT FIELD pH

RECEIVED
AUG 27 1979
DIV. CON. LAB. SERV.
ENVIRONMENTAL LAB

PARAMETER	STATE CODE	VALUE	PARAMETER	STATE CODE	VAL
Coliform, Total /100 ml	020		Arsenic	058	
Coliform, Fecal /100 ml	055		Cadmium	078	
pH (Laboratory)	050	2.9	Calcium	052	
Alkalinity / Acidity	022	Acid/730	Chromium	040	
Total Solids, Total	024		Copper	045	
Volatile	025		Iron	044	
Fixed	026		Lead	043	
Suspended Solids, Total	027		Magnesium	246	
Volatile	028		Manganese	096	
Fixed	029		Mercury	080	
Dissolved Solids Total	067		Zinc	041	
Chloride	033				
Hardness	032				
Nitrogen, Total Kjeldahl	035				
Phosphorus, Total	065				
Phosphorus, Ortho	064				
Ammonia mg/L as N	036		Turbidity	049	
Nitrite mg/L as N	037		Pesticides	121, 122	
Nitrate mg/L as N	038		Settleable Solids	023	
Sulphate	107	1580	Conductivity	034	
Hexane Extractables	048				
BOD5	019				
COD	051				

Date released from Lab: AUG 29 1979 Chemist: S. R. Peterson 100142

L-173

Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

1 gallon cubs

FIELD AND LABORATORY DATA

LG CD

MON FK SS PC BM PS BIO GW: X

LATITUDE

FK, SS, PC, PS, BM, OR BIO NO.: 80-043

LONGITUDE

BASIN | STREAM | RIVER MILE

LABORATORY NUMBER | DEPTH | SECTION | REGION

MONTH: 08 | DAY: 25 | YEAR: 79 | TIME: 1800 | SOURCE

TIDE | % FLB | FLOW CFS | WEATHER | TEMP. °F

DISSOLVED OXYGEN | DO% SAT | FIELD pH

Collect for: DES

Collected by: Treacy

Name of Stream: Piney River

Station Description: Above U.S. Titanium discharge Sta. # A

RECEIVED
AUG 27 1979
DIV. CON. LAB. SERV.
ENVIRONMENTAL LAB

PARAMETER	STATE CODE	VALUE	PARAMETER	STATE CODE	VALU
Coliform, Total /100 ml	020		Arsenic	058	
Coliform, Fecal /100 ml	055		Cadmium	078	
pH (Laboratory)	050		Calcium	052	
Alkalinity / Acidity	022	3/3	Chromium	040	
Total Solids, Total	024		Copper	045	
Volatile	025		Iron	044	
Fixed	026		Lead	043	
Suspended Solids, Total	027		Magnesium	246	
Volatile	028		Manganese	096	
Fixed	029		Mercury	080	
Dissolved Solids Total	067		Zinc	041	
Chloride	083				
Hardness	032				
Nitrogen, Total Kjeldahl	035				
Phosphorus, Total	065				
Phosphorus, Ortho	064				
Ammonia mg/l as N	036		Turbidity	049	
Nitrite mg/L as N	037		Pesticides	121, 122	
Nitrate mg/L as N	038		Settleable Solids	023	
Sulphate	107	20	Conductivity	034	
Hexane Extractables	048				
BOD5	019				
COD	051				

Date released from Lab: AUG 29 1979

Chemist: S. R. Pettus

100143

Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

1 gallon cube

FIELD AND LABORATORY DATA

SQ CD

MON FK SS PC BM PS BIO GW: X

LATITUDE

FK, SS, PC, PS, BM, OR BIO NO.: 80-043

LONGITUDE

Collect for: DES

Collected by: Treacy

Name of Stream: Pigg R.

Station Description: B downstream of U.S. Titanium discharge

BASIN | STREAM | RIVER MILE

LABORATORY NUMBER | DEPTH | SECTION | REGION

MONTH: 08 | DAY: 25 | YEAR: 79 | TIME: 1805 | SOURCE

TIDE | % FLB | FLOW CFS | WEATHER | TEMP. °F

DISSOLVED OXYGEN | DO% SAT | FIELD pH

RECEIVED
AUG 27 1979
DIV. CON. LAB. SERV.
ENVIRONMENTAL LAB

PARAMETER	STATE CODE	VALUE	PARAMETER	STATE CODE	VALUE
Coliform, Total /100 ml	020		Arsenic	058	
Coliform, Fecal /100 ml	055		Cadmium	078	
pH (Laboratory)	050	5.1	Calcium	052	
Alkalinity / Acidity	022	4/4	Chromium	040	
Total Solids, Total	024		Copper	045	
Volatile	025		Iron	044	
Fixed	026		Lead	043	
Suspended Solids, Total	027		Magnesium	246	
Volatile	028		Manganese	096	
Fixed	029		Mercury	080	
Dissolved Solids Total	067		Zinc	041	
Chloride	033				
Hardness	032				
Nitrogen, Total Kjeldahl	035				
Phosphorus, Total	065				
Phosphorus, Ortho	064				
Ammonia mg/l as N	036		Turbidity	049	
Nitrite mg/L as N	037		Pesticides	121, 122	
Nitrate mg/L as N	038		Settleable Solids	023	
Sulphate	107	270	Conductivity	034	
Hexane Extractables	048				
BODs	019				
COD	051				

Date released from Lab: AUG 29 1979 Chemist: S. R. Rice

100144

L-115

Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

1 gl cube

FIELD AND LABORATORY DATA

S CD

MON FK SS PC BM PS BIO GW: X

FK, SS, PC, PS, BM, OR BIO NO.: 80-043

LATITUDE

LONGITUDE

BASIN | STREAM | RIVER MILE

LABORATORY NUMBER | DEPTH | SECTION | REGION

MONTH: 08 | DAY: 25 | YEAR: 79 | TIME: 1980 | SOURCE

TIDE | % FLB | FLOW CFS | WEATHER | TEMP. °F

DISSOLVED OXYGEN | DO% SAT | FIELD pH

Collect for: DFS

Collected by: Treacy

Name of Stream: Piney R.

Station Description: Piney R. downstream from Rt 674 Bridge

RECEIVED
AUG 27 1979
DIV. CO... LAB. SERV.
ENVIRONMENTAL LAB

PARAMETER	STATE CODE	VALUE	PARAMETER	STATE CODE	VALU
Coliform, Total /100 ml	020		Arsenic	058	
Coliform, Fecal /100 ml	055		Cadmium	078	
pH (Laboratory)	050	4.6	Calcium	052	
Alkalinity / Acidity	022	2/15	Chromium	040	
Total Solids, Total	024		Copper	045	
Volatile	025		Iron	044	
Fixed	026		Lead	043	
Suspended Solids, Total	027		Magnesium	246	
Volatile	028		Manganese	096	
Fixed	029		Mercury	080	
Dissolved Solids Total	067		Zinc	041	
Chloride	033				
Hardness	032				
Nitrogen, Total Kjeldahl	035				
Phosphorus, Total	065				
Phosphorus, Ortho	064				
Ammonia mg/l as N	036		Turbidity	049	
Nitrite mg/L as N	037		Pesticides	121, 122	
Nitrate mg/L as N	038		Settleable Solids	023	
Sulphate	107	35	Conductivity	034	
Hexane Extractables	048				
BOD5	019				
COD	051				

Date released from Lab: AUG 29 1979

Chemist: S. R. Peters

100145

Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

Metals

FIELD AND LABORATORY DATA

CD

MON FK SS PC BM PS BIO GW: X

FK, SS, PC, PS, BM, OR BIO NO.: 80-043

LATITUDE

LONGITUDE

BASIN | STREAM | RIVER MILE

LABORATORY NUMBER | DEPTH | SECTION | REGION

MONTH: 08 | DAY: 25 | YEAR: 79 | TIME: 1750 | SOURCE

TIDE | % FLB | FLOW CFS | WEATHER | TEMP. °F

DISSOLVED OXYGEN | DO% SAT | FIELD pH

Collect for: DES

Collected by: Treacy

Name of Stream: Piney R.

Station Description: U.S. Titanium discharge from drain area into Piney R.

RECEIVED
AUG 27 1979
DIV. CO... SERV.
ENVIRONMENTAL LAB.

PARAMETER	STATE CODE	VALUE		PARAMETER	STATE CODE	VALUE
Coliform, Total /100 ml	020			Arsenic	058	
Coliform, Fecal /100 ml	055			Cadmium	078	
pH (Laboratory)	050			Calcium	052	
Alkalinity	022			Chromium	040	
Total Solids, Total	024			Copper	045	
Volatile	025		✓	Iron	044	73
Fixed	026			Lead	043	
Suspended Solids, Total	027			Magnesium	246	
Volatile	028			Manganese	096	
Fixed	029			Mercury	080	
Dissolved Solids Total	067			Zinc	041	
Chloride	083					
Hardness	032					
Nitrogen, Total Kjeldahl	035					
Phosphorus, Total	065					
Phosphorus, Ortho	064					
Ammonia mg/l as N	036			Turbidity	049	
Nitrite mg/L as N	037			Pesticides	121, 122	
Nitrate mg/L as N	038			Settleable Solids	023	
Sulphate	107			Conductivity	034	
Hexane Extractables	048					
BOD5	019					
COD	051					

Date released from Lab: SEP 5 1979 Chemist: Joni Anderson 100146

L-111

Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

1 metals

FIELD AND LABORATORY DATA

LG CD

MON FK SS PC BM PS BIO GW: [ ][4][ ][ ][ ][ ][ ][ ]

FK, SS, PC, PS, BM, OR BIO NO.: 80-043

LATITUDE:

LONGITUDE:

Collect for: DES

Collected by: Treacy

Name of Stream: Pinch River

Station Description: Above U-S Titanium discharge Station A

BASIN: [ ][ ]

STREAM: [ ][ ][ ]

RIVER MILE: [ ][ ][ ][ ][ ]

LABORATORY NUMBER: [ ][ ][ ][ ][ ][ ]

DEPTH: [ ][ ][ ]

SECTION: [ ][ ][ ]

REGION: [ ]

MONTH DAY YEAR: 08 25 79

TIME: 1800

SOURCE: [ ][ ][ ][ ][ ]

TIDE: [ ]

% FLB: [ ][ ][ ]

FLOW CFS: [ ][ ][ ][ ][ ]

WEATHER: [ ]

TEMP. °F: [ ][ ][ ]

DISSOLVED OXYGEN: [ ][ ][ ][ ][ ]

DO% SAT: [ ][ ][ ]

FIELD pH: [ ][ ][ ][ ][ ]

RECEIVED
AUG 27 1979
DIV. CO[illegible] SERV.
ENVIRONMENTAL LAB

PARAMETER	STATE CODE	VALUE	PARAMETER	STATE CODE	VALUE
Coliform, Total /100 ml	020		Arsenic	058	
Coliform, Fecal /100 ml	055		Cadmium	078	
pH (Laboratory)	050		Calcium	052	
Alkalinity	022		Chromium	040	
Total Solids, Total	024		Copper	045	
Volatile	025		Iron	044	1.5
Fixed	026		Lead	043	
Suspended Solids, Total	027		Magnesium	246	
Volatile	028		Manganese	096	
Fixed	029		Mercury	080	
Dissolved Solids Total	067		Zinc	041	
Chloride	033				
Hardness	032				
Nitrogen, Total Kieldahl	035				
Phosphorus, Total	065				
Phosphorus, Ortho	064				
Ammonia mg/l as N	036		Turbidity	049	
Nitrite mg/L as N	037		Pesticides	121, 122	
Nitrate mg/L as N	038		Settleable Solids	023	
Sulphate	107		Conductivity	034	
Hexane Extractables	048				
BOD5	019				
COD	051				

Date released from Lab: SEP 5 1979 Chemist: [signature] 100147

L-178

Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

1 metals

FIELD AND LABORATORY DATA

LO CO AI

ION FK BS PC BM PS BIO GW: X

LATITUDE

FK, BS, PC, PS, BM, OR BIO NO.: 80-043

LONGITUDE

BASIN | STREAM | RIVER MILE

LABORATORY NUMBER | DEPTH | SECTION | REGION

MONTH: 08 | DAY: 25 | YEAR: 79 | TIME: 1805 | SOURCE

TIDE | % FLB | FLOW CFS | WEATHER | TEMP, °F

DISSOLVED OXYGEN | DO% SAT | FIELD pH

Collect for: DES

Collected by: D. Tracey

Name of Stream: Piney R.

Station Description: B downstream of U.S. Titanium discharge

RECEIVED
AUG 27 1979
DIV. CO... LAB. SERV.
ENVIRONMENTAL LAB

PARAMETER	STATE CODE	VALUE	PARAMETER	STATE CODE	VALUE
Coliform, Total /100 ml	020		Arsenic	058	
Coliform, Fecal /100 ml	055		Cadmium	078	
pH (Laboratory)	050		Calcium	052	
Alkalinity	022		Chromium	040	
Total Solids, Total	024		Copper	045	
Volatile	025		✓ Iron	044	2.9
Fixed	026		Lead	043	
Suspended Solids, Total	027		Magnesium	246	
Volatile	028		Manganese	096	
Fixed	029		Mercury	080	
Dissolved Solids Total	067		Zinc	041	
Chloride	083				
Hardness	032				
Nitrogen, Total Kjeldahl	035				
Phosphorus, Total	065				
Phosphorus, Ortho	064				
Ammonia mg/l as N	036		Turbidity	049	
Nitrite mg/L as N	037		Pesticides	121, 122	
Nitrate mg/L as N	038		Settleable Solids	023	
Sulphate	107		Conductivity	034	
Hexane Extractables	048				
BOD_5	019				
COD	051				

Date released from Lab: SEP 5 1979

Chemist: [illegible]

100148

MEMORANDUM

State Water Control Board

4010 WEST BROAD STREET P. O. Box 11143 RICHMOND, VA. 232

SUBJECT: PC 80-163/FK 80-043 Piney River/Tye River

TO: PREP Central

FROM: R. W. Bolgiano RWB

DATE: 27 August 1979

COPIES: VRO PREP File

The writer received a pager call at 11:55 P.M. Friday, 24 August 1979, and was appraised of a fish kill in the Tye River in Nelson County. The circumstances of the original fish kill report were learned by telephone conversation with Penny Marshall during the first hour of Saturday, 25 August 1979. Apparently, a Mr. Pete Archbell reported that there were dead fish in the Tye River at the Route 29 bridge to Mr. Bob Bonderant, the Amherst County Game Warden. Mr. Bonderant reported the fish kill to the West Central Regional Office at approximately 16:00 Friday, 24 August 1979.

The writer and L. M. Simmons arrived at American Cyanamid at 9:00 A.M. and inspected the lagoons. There was approximately a 0.1 MGD discharge flowing through the drainage ditch below the lower lagoon.

The investigators ascertained the spatial extent of the fish kill in the Piney River and the Tye River to be approximately 13.8 miles. The writer notified DES personnel at 11:00 A.M. of the extent of the kill. It was decided that the investigators and the DES personnel would meet at the Route 29 bridge across the Tye at 14:00 to map out the count stations.

A lightning storm with a heavy downpour occurred at 15:00. The DES personnel arrived at 15:30. The writer was assigned four one mile segments of the Tye River to count. The first segment was the 100 yard segment downstream of the dam at Route 29. The writer counted the South half of this segment while Bob Pitchford of DES counted the northern half. These data were turned over to Dave Paylor of DES.

For information concerning water samples and pH measurements refer to the DES report.

/jw

Attachments (Maps)

MEMORANDUM

State Water Control Board

2111 North Hamilton Street P. O. Box 11143 Richmond, VA. 23230

SUBJECT: PC 80-163/FK 80-043 Piney River/Tye River

TO: DES File

FROM: D. H. Treacy DHT

DATE: September 28, 1979

COPIES:

At approximately 10:00 am on Saturday, August 25, 1979, a call was received by David Paylor (DES) at his home from PReP Central advising him of a request for assistance by VRO to count dead fish on the Piney and Tye Rivers in Nelson County. The following staff were contacted by Mr. Paylor to assist with the investigation; Robert Pitchford, Ronald Gregory, Les Balderson, Janet Robinson and Dennis Treacy. These staff members met at the SWCB Warehouse to gather equipment and left Richmond at 12:30 pm.

At 3:30 pm the DES crew arrived at the site. A heavy rain storm was in progress at that time. Already at the site were Ralph Bolgiano and Larry Simmons, VRO, who informed us of their findings of that morning. They informed us that the kill involved many species of fish in large numbers. The kill was reported to have affected about 14 miles of stream including both the Piney River and Tye River. The lower limit of this affected area was at a point just downstream of the Rt. 654 bridge on the Tye River and extended upstream on the Piney River at a point just below the U.S. Titanium discharge.

Because of the rain and the late hour a fish count was designed by Mr. Paylor to cover the entire affected portion of both streams utilizing one mile segments. Investigators were to count 100 yard portions within each of these mile segments. At this point the investigators split into teams to proceed with the count.

Larry Simmons, Ronald Gregory and the writer proceeded to the U.S. Titanium plant site. Upon arriving, field parameters were taken at a point upstream of the U.S Titanium plant on the Piney River at the Rt. 151 bridge. Live minnows were seen in the stream that possessed a temperature of 78°F and pH of 7.5 (colormetric method).

Pictures were taken of this station along with water samples for laboratory analysis. We proceeded to the U.S. Titanium plant site and found the front gate to be locked. A back way was located near an adjacent railroad track so we proceeded to the old American Cyanamid holding lagoons which contained copperas runnoff from several areas of copperas waste piles. Upon observing both lagoons, the lower lagoon was found to have possible overflow as evidenced by red colored waste in the drainage ditch below the lower lagoon. Pictures were taken of this occurence. Also, the pump house, which contains the pump for transferring liquid

from the lower lagoon to the upper lagoon, was open revealing the pump which was smoking and not pumping at all. However, levels of liquid wastc were well below the earthen dams. Samples taken in the lower lagoon revealed a pH of <4.0; those taken in the ditch below this lagoon were ≤ 4.0 also. Shortly after our arrival at the lagoons a Mr. Campbell, who identified himself as caretaker, arrived and explained that the pump was not broken but clogged instead. He appeared to correct this problem. He also stated that there was definitely no recent overflow of the lower lagoon.

At this point we followed the drainage pattern of the areas below the copperas wastes piles down to the actual outfall of U.S. Titanium into the Piney River. All points of the drainage possessed pH values of <4.0. At the Piney River pH readings were taken at points above and below the discharge as well as in the actual discharge. Directly upstream the pH was recorded as 6.0 while values in the outfall and directly below remained at <4.0. We began a fish count at this point and noted several dead minnows.

After leaving the plant site we coordinated with other investigators by radio and began counting 100 yard segments at one mile intervals. Our efforts were hampered by an increase in stream flow and subsequent rise in turbidity of the stream. This allowed only floating fish to be seen. Several investigators also reported this problem and as a result the actual fish estimate was significantly less than it could have been.

At the completion of the fish count all investigators met at a central location to exchange count sheets, lab samples and recorded field data. The DES crew then left for Richmond at approximately 9:30pm.

DHT:dah

FISH KILL REPORT

FISH KILL # 81-002
STREAM Piney River
BASIN James
~~CITY~~/COUNTY Nelson - Amherst

SUMMARY:
On July 11, 1980 the PReP office in Richmond was notified of a fish kill on the Tye River. Investigations by SWCB staff members July 11,12 and 13, 1980 revealed dead fish in the Piney River below US Titanium and in the Tye River below the confluence with the Piney. Testimony of a witness and Titanium employees indicated that heavy thunderstorms on July 9 and 10, 1980 caused an overflow from the waste holding ponds on the Titanium property which sent acidic waste into the Piney River. As a result 53,989 fishes of several species were killed. Replacement cost of fish was set at $4,595.82. Cost of investigation was $1,383.14. Total cost to the Commonwealth of Virginia was $5,978.96.

CONCLUSIONS:
(1).Dead and distressed fish were observed on the Tye River below the mouth of the Piney River on Thursday morning July 10, 1980. (2).Dead fish were counted on the Piney River from the mouth, upstream to a point ½ mile below the US Titanium discharge on Saturday, July 12, 1980. Live healthy fish were found just upstream of that discharge. (3).Heavy thunderstorms passed through Nelson County on the evenings of Wednesday, July 9, and Thursday, July 10, 1980. (4).Mr. Billy Thompson reported no spill at US Titanium Wednesday evening, July 9 and that the catch basin was "empty" upon his inspection, even after the heavy thunderstorm. (5).Mr. Jack Campbell stated that following the Thursday thunderstorm, the catch basin overflowed between approximately 5pm and 11pm on Thursday night, July 10, 1980. This discharge was not reported to the SWCB at that time. (6).Since the trail of dead fish led to within ½ mile of the US Titanium discharge (no dead fish were seen above the discharge) and the catch basin definitely overflowed on Thursday July 10 and may have filled and overflowed on Wednesday night before or after the earlier inspection, it is the conclusion of this investigation that US Titanium is responsible for this fish kill. This fish kill is similar to past kills caused by US Titanium.

1.0 REPORTED INFORMATION: THE INVESTIGATION

Dead fish on Piney River and Tye River below US Titanium plant.

Reported by GL Brantley-Nelson Co. Game Ward **Date** 7-11-80 **Time** 1230
Report received by: PReP central **Date** 7-11-80
Investigated by: Joe Fromal **Date** 7-11-80
Investigated by: Richard Ayers **Date** 7-12 & 13-80
Investigated by: Dave Chance **Date** 7-12 & 13-80
Final Report Edited by: Richard Ayers

CHAIN OF NOTIFICATION (list of names in order of contact)

(1) Enforcement Division	Jim Hensley	**(date)**	7-14-80	**(time)**	
(2) Regional Represenative	Joe Fromal	**(date)**	7-11-80	**(time)**	1230
(3) Game Warden (CGIF)	G. L. Brantley	**(date)**	7-11-80	**(time)**	
(4) (name)	Richard Ayers	**(date)**	7-11-80	**(time)**	1800
(5) (name)		**(date)**		**(time)**	

DATE FISH KILL OCCURRED (as determined by investigation) July 9 and/or 10, 1980
DATE FISH KILL ENDED July 10, 1980

PLAINTIFF'S EXHIBIT 331

100152

Fish Kill No. 81-002

Weather Previous to Kill Thunderstorms
Weather During Kill
Weather Following Kill clear
(If rain - include amount)

WITNESSES: name William D. Wright
address
phone 804-263-4628
position local resident

2.0 INVESTIGATORS DISCUSSION:

Heavy thunderstorms passed through the Nelson County area on the evening of Wednesday July 9, 1980 and Thursday July 10. Mr. William D. Wright, a local resident, observed many dead and distressed fish in the Tye River below the mouth of the Piney River on Thursday morning. According to Mr. Wright, "the banks were white with dead fish", but rising water on Thursday washed many of these fish away. He reported the kill to Nelson County Game Warden, G. L. Brantley. Brantley relayed the message to the Nelson County Sheriff's Office and they notified PReP Central in Richmond. The call came into the PReP office at 1220 on July 11, 1980. At 1230 Joe Fromal of the Valley Regional Office was notified and he began his investigation. The reader is referred to Fromal's memo of July 15, 1980 for details of his investigation (Appendix A). The July 14, 1980 memo from Tedd Jett provides details of the circumstances at the U.S. Titanium property which lead to the spill. (Appendix B).

These few details will supplement Fromal's memo. On July 12 Dave Chance and Dwight Sours began counting the upper section of the kill by walking the Piney River from Route 151 downstream. They saw no dead fish and some live fish above the U.S. Titanium discharge. Chance estimated that the pipe was discharging 5-10 gallons per minute when he saw it. From the pipe downstream to the first powerline crossing (approximately ½ mile) no fish were seen, live or dead. Below the powerline dead fish were counted as outlined by Fromal. There were no sources of pollution other than U.S. Titanium from the Route 151 bridge down to the point where dead fish were first observed.

The twelfth segment, six miles below the start of the kill, was not counted because the river is wide, deep and slow moving at this point. The investigators could not wade the river and access by boat was not practical. This ½ mile reach has not been included in the fish count calculations.

On July 13, 1980 Chance and Ayers counted segments 21 thru 29 by canoe. The dead fish were not floating so we did not recount those from Saturday. At the confluence of the Tye and Buffalo Rivers (segment 26) the Tye was muddied considerably by sediments carried in the Buffalo. Most dead fish observed at this point were on the Tye River side of the confluence. Below this point the number of dead fish declined rapidly indicating that the dilution by the Buffalo had probably neutralized the toxic waters of the Tye.

This kill appears to be a recurrence of problems we have had on Piney River for some time. The copperas waste piles at U.S. Titanium are vulnerable to washing off into the river when dry weather is followed by a severe thunderstorm. The last kill occurred August 24, 1979, FK 80-043.

Fish Kill No. 81-002

2.0 INVESTIGATORS DISCUSSION Con't.

It is obvious, from previous experience with kills on the Piney River, that an overflow of the waste ponds at U.S. Titanium did occur and resulted in a fish kill in the Piney and Tye rivers.

2.1 STATION DESCRIPTION:

1. Tye River upstream from Rt. 739 bridge.

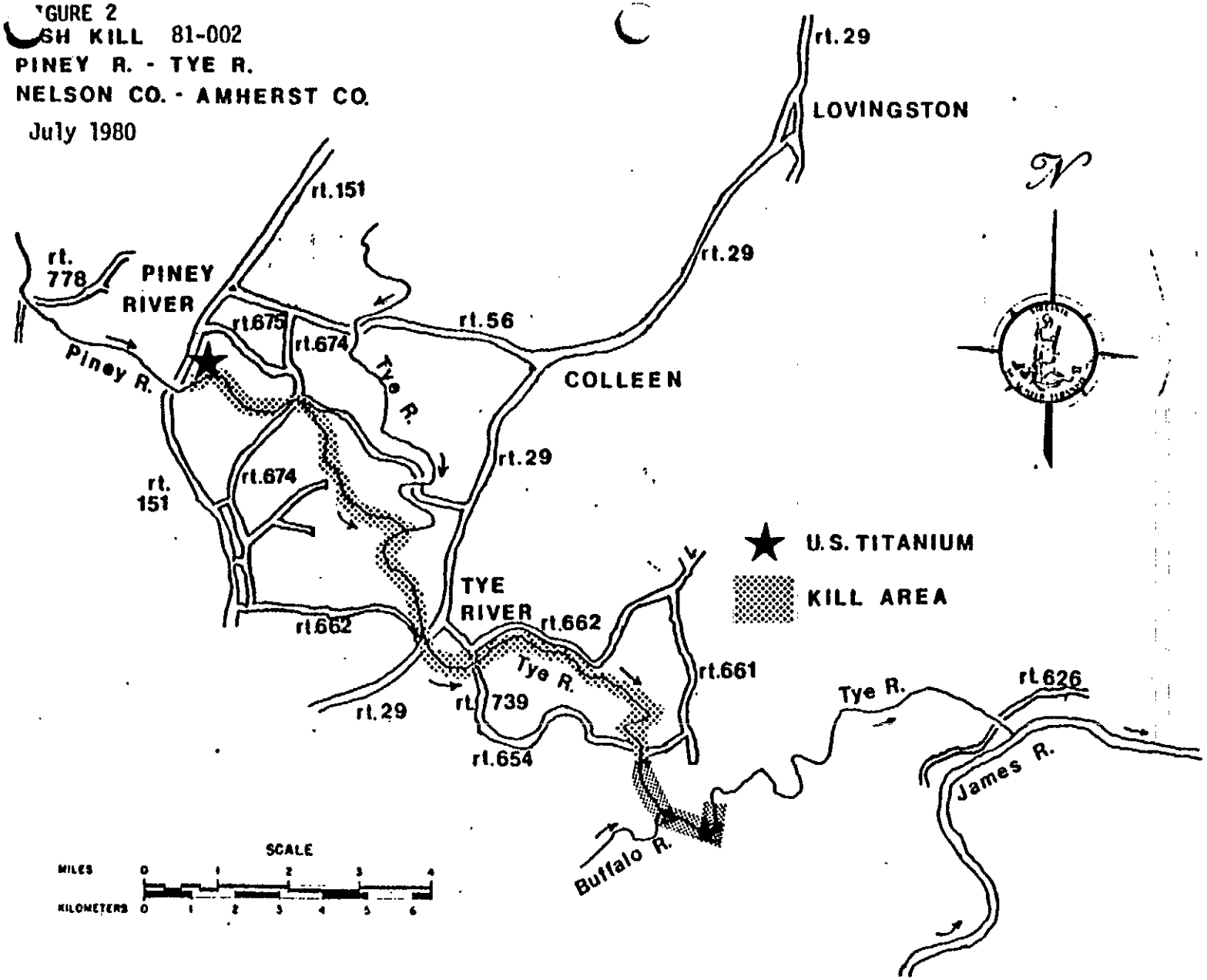
.2 PICTURES TAKEN: (identify pictures: slides (s) or prints (p))

Location:

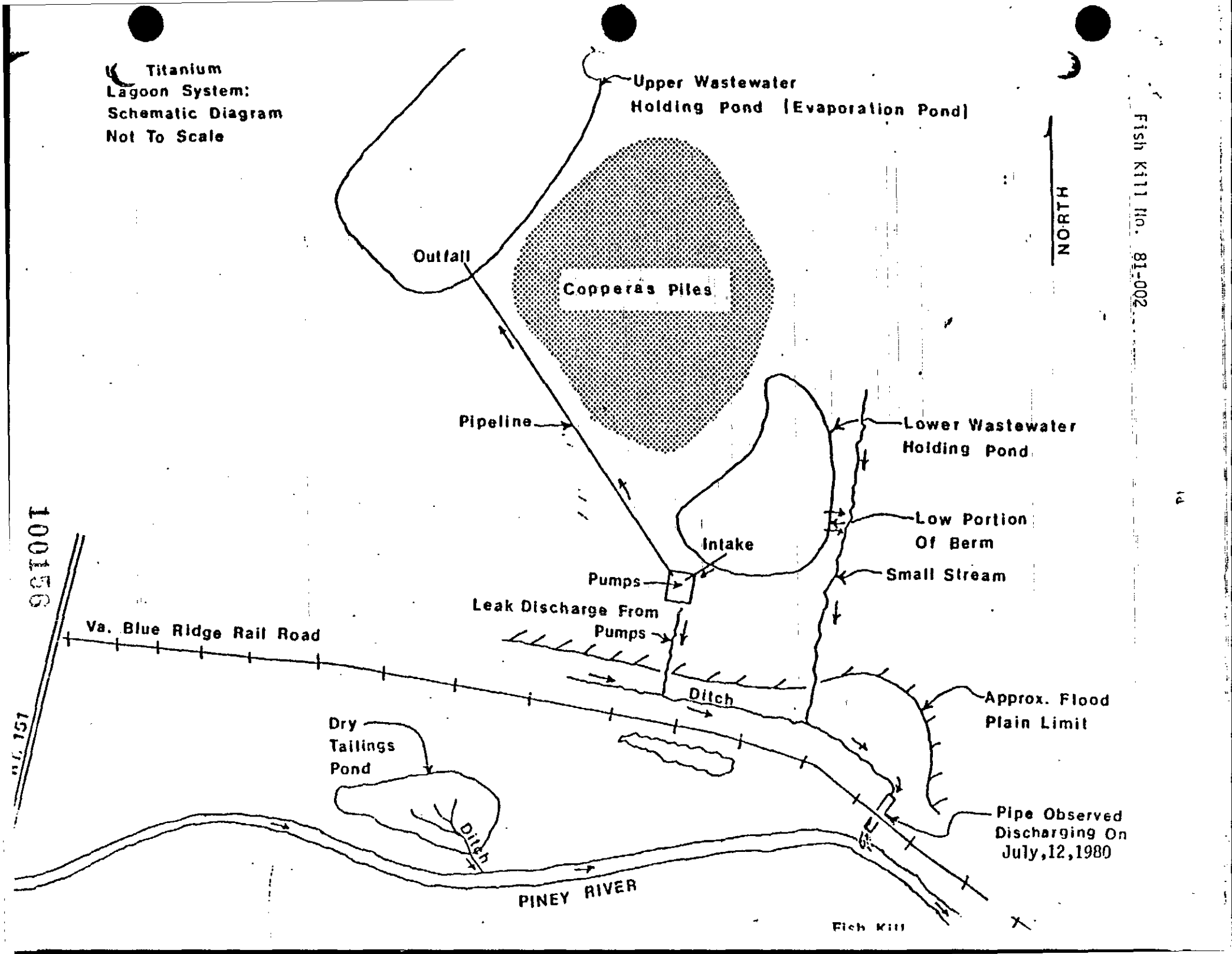
1. _____ 6. _____
2. _____ 7. _____
3. _____ 8. _____
4. _____ 9. _____
5. _____ 10. _____

100154

FIGURE 2
FISH KILL 81-002
PINEY R. - TYE R.
NELSON CO. - AMHERST CO.
July 1980



4b


Titanium
Lagoon System:
Schematic Diagram
Not To Scale
Upper Wastewater
Holding Pond (Evaporation Pond)
NORTH
Outfall
Copperas Piles
Pipeline
Lower Wastewater
Holding Pond
Low Portion
Of Berm
Intake
Small Stream
Pumps
Leak Discharge From
Pumps
Va. Blue Ridge Rail Road
Ditch
Approx. Flood
Plain Limit
Dry
Tailings
Pond
Ditch
Pipe Observed
Discharging On
July,12,1980
PINEY RIVER
Fish Kill
Fish Kill No. 81-002
1001336

Fish Kill No. 81-002

4.0 VISUAL OBSERVATIONS:

4.1 WATER:

Station	D.O. mg/l	pH	Temp. (°F)	Dead Fish ?	Color	Turbidity
1		7.0		yes	brown	high
2						
3						
4						
5						
6						
7						
8						
9						
10						

Station	Floating Solids	Surface Film	Flow	Tide Stage	Odor (def)	Other
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

100157

Fish Kill No. 81-002

4.2 FISH:

GENERAL APPEARANCE:

nervous, scary_____
sinking to bottom_____
gasping at surface 7-10-80 according to witness
unusual color_____
frantic_____
slugish_____
spiraling_____
flashing_____
rubbing against bottom_____
able to avoid capture_____
floating listlessly_____
swimming upside down_____
other_____

Fish were either moribund on bottom in shallows or live and healthy on 7-12 & 13-80

ARRANGEMENT IN WATER:

normal distribution_____
moving into other water sources_____
floating towards outlet_____
attempting to leave water_____
schooling_____
near surface_____
crowding water inlet_____
other_____

BODY SURFACE: *

normal_____ light & dark patches_____ bleached most bloated some
bluish film: in patches_____ or all over_____
grayish-white: in patches_____ or tufts_____
deep open lesions with pus and blood_____
swollen areas as furuncles_____
shallow red ulcers: small_____ or large_____
body splitting open along midline many
muscous on skin_____
other_____

FINS: *

normal_____
swollen_____
necrotic_____
frayed_____
bluish white_____
parasite present_____
twisted_____
eroded_____
spots present: white_____
black_____
blood-shot_____
other:_____

CAUDAL PEDUNCLE: *

slightly swollen_____
very swollen_____
necrotic_____
inflamed_____
bluish-white_____
fungus-like tufts_____
other_____

GILLS: *

gill color: bright red_____ red_____ pink some white most
gill cover widely expanded_____
swollen_____
covered with mucus, food and dirt particles_____
patches: white_____ brown_____ gr. y_____
other_____

100158

* Indicate approximate number of fish having these characteristics. Look for general trends, not specific fish (few, many, all, none).

Fish Kill No. 81-002

EYES: *

normal ____ bulging few
opaque most ____ one eye missing ____
white: lens ____ or center ____ both eyes missing some
tiny spots in lens ____ if a needle is inserted in the eye socket
red spots in cornea ____ and the eye is pressed while fish head is
popeye ____ under water, gas bubbles ____ or opaque
other ____ fluid ____ escapes.

* Indicate approximate number of fish having these characteristics. Look for general trends, not specific fish. (few, many, all, none)

OTHER CONDITIONS OR SYMPTOMS NOTED:

The fish had been dead for 1 or 2 days when the count was made. No distressed fish were observed.

5.0 SAMPLES AND ANALYSES:

5.1 CHEMICAL SAMPLES COLLECTED:
(circle samples not collected by State Water Control Board)

source (pollution) ____ polluted area X
source (oil) ____ spill area ____
1/2 gallon glass ____ quart plastic ____
gallon plastic ____ quart glass ____
mercury bottles ____ mud ____
____ soil ____

5.2 BIOLOGICAL SAMPLES COLLECTED: *
(circle samples not collected by State Water Control Board)
Fish must be properly identified to genus on lab sheet

fish ____ benthic ____
oyster ____ clam ____
crab ____ mussel ____
other ____ other ____

* Specify whole fish, edible meat or organs to be analized

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Fish Kill No. 81-002

5.3 CHEMICAL ANALYSIS
check box for requested analysis

	Station	1	1		
	Date	7-11-80	7-11-80		
	Time	1630	1630		
	Lab Number	13533	13533		
	Parameter -				
[X]	BOD_5, mg/l	10			
[ ]	MPN / 100 ml				
[X]	pH (laboratory	6.5			
[ ]	Acidity (total) mg/l				
[X]	Alkalinity (total), mg/l	8			
[ ]	Path Alkalinity, mg/l				
[ ]	Settleable Solids, mg/l				
[ ]	Total Solids - tot, mg/l				
	Vol, mg/l				
	Fix, mg/l				
[X]	Susp. Solids- Tot, mg/l	28			
	Vol, mg/l	3			
	Fix, mg/l	25			
[X]	Chlorides, mg/l as Cl	2			
[X]	Tot Nit, kjel, mg/l as N	0.2			
[ ]	Ammonia, mg/l as N	0.1-			
[X]	Nitrite, mg/l as N	0.01			
[X]	Nitrate, mg/l as N	0.31			
[ ]	Hydrol. Phosphates, mg/l as P				
[X]	Ortho Phosphates, mg/l as P	0.03			
[X]	Total Phosphates, mg/l as P	0.1			
[X]	Chromium Tot, mg/l		20		
[X]	Zinc, mg/l		60		
[X]	Lead, mg/l		2-		
[X]	Iron, mg/l		1400		
[X]	Copper, mg/l		10-		
[ ]	Manganese, mg/l				
[ ]	Hexane Extractables, mg/l				
[ ]	Chemical Oxygen Demand, mg/l				
[ ]	Oils by Infrared, mg/l				
[X]	Sulphate mg/l	8			
[X]	Mercury mg/l		0.3-		
[ ]	Cadmium mg/l		10-		
[X]	Nickel mg/l		100-		
[ ]					
[ ]					

100160

Fish Kill No. 81-002

6.0 TOXICITY OF ELEMENTS INVOLVED AS REPORTED IN LATEST LITERATURE:

REFERENCE:

REFERENCE:

REMARKS:

The location and circumstances of this fish kill are so similar to those occurring in previous years FK 80-043 and FK 78-011 that there can be little doubt as to the source of the toxic materials. Water samples collected by Fromal on 7-11-80 did not show high sulfates or acidity levels associated with previous fish kills indicating that the slug had already passed downstream. Levels of heavy metals chromium, zinc and iron are elevated but may be residual material dissolved in water column after passage of acidic slug of runoff from copperas piles.

7.0 BENTHIC, ALGAL EXAMINATION (CURSORY):

Station	Substrate	Aquatic plants	Algae	Benthic animals	Tolerance %			How compare with control
					Tol	Fac	Sensit	
1								
2								
3								
4								
5								
6								
7								
8								
10								

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Fish Kill No. 81-002

8.0 ROUGH FIGURES FOR FISH COUNT:

8.1 Lake, pond or river; total count of every fish: _____

OR

8.2 100 yard segment/half mile area count; ~~lake~~ or river: 53,989

Total distance of kill in stream/pond miles/acres: 14½ miles

Segment	Species, No. size	Species, No., size	Species, No., Size
(1st. fish seen) 1st. 100 yds.	Minnows 50 All	Darters 3 All	
2nd. 100 yds.	Minnows 29 All	Darters 1 All	
3rd. 100 yds.	Minnows 627 All	Madtoms 2 All	Suckers 78 1-3"
4th. 100 yds.	Minnows 225 All	Darters 1 All	Suckers 2 1-3"
			Suckers 1 4-6"
	Sunfish 1 4"		
5th. 100 yds.	Minnows 100 All	Darter 7 All	
6th. 100 yds.	Minnows 825 All	Darter 1 All	Suckers 15 1-3"
7th. 100 yds.	Minnows 350 All	Darters 2 All	Madtoms 3 All
	Suckers 6 1-3"	Sunfish 2 2"	
8th. 100 yds.	Minnows 242 All	Suckers 5 1-3"	
9th. 100 yds.	Minnows 125 All	Madtoms 1 All	Suckers 10 1-3"

Segment	Species, No., Size	Species, No., Size	Species, No., size
10th. 100 yds.	Minnows 250 ALL	Sucker 1 1-3"	Suckers 1 4-6"
11th. 100 yds.	Minnows 150 All	Darter 1 All	Sucker 1 1-3"
			Sucker 1 4-6"
12th. 100 yds. ½ mile	NOT COUNTED	NOT COUNTED	NOT COUNTED
13th. 100 yds.	Minnows 258 All	Suckers 14 1-3"	Sunfish 2 3"
	Darters 2 All		
	Madtoms 8 All	Pirate Perch 1 All	
14th. 100 yds.	Minnows 235 All	Suckers 6 4-6"	Smallmouth bass 12, 2"
Smallmouth bass 2, 10"	Darters 14 All	Suckers 4 9-10"	" " 9, 3"
" " 1 12"	Madtoms 20 All	Suckers 4 12+"	" " 5, 5"
Sunfish 4 4"	Suckers 1 1-3"	Carp 1 1-6"	" " 4, 6"
15th. 100 yds.	Minnows 74 All	Suckers 13 4-6"	Smallmouth bass 5, 2"
Smallmouth bass 2 7"	Darters 6 All	" 1 7-8"	" " 5, 3"
" " 1 8"	Madtoms 15 All	" 5 9-10"	" " 2, 4"
" " 2 10"	Suckers 1 1-3"	" 1 12+	" " 7, 6"
Carp 1 1-6"	Sunfish 2 2"		
	" 1 6"		
16th 100 yds	Minnows 435 All	Suckers 4 1-3"	Smallmouth bass 3, 2"
Carp 2 1-6"	Darters 23 All	" 14 4-6"	" " 7, 3"
Sunfish 1 3"	Madtoms 3 All	" 5 7-8"	" " 4, 6"
" 1 5"		" 6 12+"	" " 4, 10"
17th 100 yds	Minnows 142 All	Suckers 6 1-3"	Smallmouth bass 7, 2"
Sunfish 2 2"	Darters 19 All	" 4 4-6"	" " 1, 3"
" 1 3"	Madtoms 14 All	" 4 9-10"	" " 3, 5"
" 1 4"	Carp 1 1-6"	" 8 12+"	" " 4, 6"
	" 1 7-9"		" " 1, 7"
18th 100 yds	Minnows 97 All	Suckers 2 4-6"	Smallmouth bass 5, 2"
Carp 1 7-9"	Madtoms 3 All	" 5 7-8"	" " 5, 3"
Sunfish 1 3"		" 3 9-10"	" " 1, 4"
" 2 5"		" 6 12+"	" " 2, 6"
			" " 1, 7"
			" " 1, 10
19th 100 yds	Minnows 140 All	Suckers 10 1-3"	Smallmouth bass 6, 2"
Carp 1 7-9"	Darters 36 All	" 2 9-10"	" " 1, 6"
Sunfish 1 1"	Madtoms 6 All	" 3 12+"	" " 1, 8"
" 1 4"			
" 1 6"			
20th 100 yds	Minnows 103 All	Suckers 1 1-3"	Smallmouth bass 8, 2"
Carp 1 10-11	Darter 1 All	" 2 7-8"	" " 4, 3"
Sunfish 1 6"	Madtoms 4 All	" 9 12+"	" " 2, 4"
			" " 2, 6"
			" " 1, 8"
			" " 1, 10

100163

21st 100 yds		Minnows	144	All	Suckers	23	1-3"	Smallmouth bass	2	3"
		Darters	10	All	"	2	12+"	"	1	5"
		Madtoms	1	All				"	2	8"
22nd 100 yds		Minnows	118	All	Suckers	3	1-3"	Smallmouth bass	2	2"
Carp	1 7-9"	Darters	3	All	"	3	4-6"	"	2	3"
"	1 14"	Madtoms	1	All	"	4	7-8"	"	1	6"
Sunfish	1 3"				"	5	9-10"	"	1	8"
"	1 5"				"	1	12+"	"	1	9"
								"	1	11"
23rd 100 yds		Minnows	145	All	Smallmouth bass	6	2"	Sunfish	1	3"
		Madtoms	13	All	"	"	17 3"	"	1	4"
		Suckers	2	1-3"	"	"	1 4"			
		"	2	4-6"	"	"	1 5"			
		"	3	7-8"	"	"	1 6"			
		"	3	12+"	"	"	5 8"			
					"	"	2 10"			
24th 100 yds		Minnows	220	All	Suckers	10	1-3"	Smallmouth bass	11	2"
Sunfish	1 4"	Darters	18	All	"	7	4-6"	"	1	3"
"	1 5"	Madtoms	2	All	"	2	7-8"	"	1	10"
					"	2	9-10"			
					"	1	12+"			
25th 100 yds		Minnows	110	All	Suckers	1	4-6"	Smallmouth bass	2	2"
		Darters	7	All	"	1	7-8"	"	1	6"
		Madtoms	3	All	"	2	9-10"	"	3	8"
		Suckers	6	1-3"	"	3	12+"	Sunfish	1	6"
26th 100 yds		Minnows	35	All	Smallmouth bass	1	1"	Sunfish	2	4"
		Madtoms	2	All	"	"	2 2"	"	1	6"
		Suckers	1	4-6"						
27th 100 yds		Minnows	4	All	Suckers		1 12+"	Smallmouth bass	3	8"
Sunfish	2 4"	Madtoms	4	All	Smallmouth bass	12	3"	" "	1	13"
"	1 5"	Suckers	2	4-6"	"	"	2 6"	Rock bass	1	5"
"	3 6"	"	4	9-10"	"	"	1 7"	" "	1	6"
"	1 7"									
Channel Catfish 1 22"										
28th 100 yds		Minnows	1	All	Smallmouth bass	1	7"			
29th 100 yds		Minnows	2	All	Smallmouth bass	1	2"			
					"	"	1 10"			

Fish Kill No. 81-002

9.0 COST:

Cost of investigation: Bureau of Surveillance and Field Studies, Individual sheets: $ 1,360.84 Enforcement _____
Other: _____
Cost of freshwater fish (Commission of Game and Inland Fisheries): $ 4,595.82
Cost of marine fish: _____
Other cost (explain): Lab $ 22.30
Total cost to State of Virginia: $ 5,978.96

Copies: Director BSFS, Regional Office, Enforcement, DES File (orig.), Commission of Game and Inland Fisheries, Investigator, HATS File

Report completed and distribution made: _____ _____
(signed) (date)

Enclosures:

MISC. NOTES:

Calculation of expansion factors:

Segments 1 thru 11 $\frac{1760 \text{ yards per mile} \times 5.5 \text{ miles}}{11 \text{ segments} \times 100 \text{ yards}} = 8.8$

Segments 13 thru 29 $\frac{1760 \text{ yards per mile} \times 8.5 \text{ miles}}{17 \text{ segments} \times 100 \text{ yards}} = 8.8$

Sample calculation:

	number counted	
2" Sunfish	Segs. 1-11	2 X 8.8 = 17.6
	Segs. 13-29	4 X 8.8 = 35.2
		52.8

Total number killed = 53

100165

VIRGINIA STATE WATER CONTROL BOARD

TOTAL COST SUMMARY - FIELD INVESTIGATION

:LUTION COMPLAINT NO. 81-018 FISH KILL NO. 81-002

ITEMIZED BELOW ARE EXPENSES INCURRED BY THE VIRGINIA STATE WATER CONTROL BOARD DURING THE SUBJECT INVESTIGATION

NUMBER OF PERSONNEL IN SUBJECT INVESTIGATION: 4

TOTAL MAN-HOURS IN FIELD AND/OR REPORT WRITING: 112

TOTAL WAGE EXPENSE BASED ON HOURLY RATE FOR ALL PARTICIPANTS..... $ 1,074.36

TOTAL EXPENSE FOR LABORATORY 22.30

TOTAL NUMBER OF MILES DRIVEN BY: STATE POOL VEHICLE 259

STATE AGENCY VEHICLE 882

PRIVATE VEHICLE -

TOTAL MILEAGE EXPENSE:

STATE POOL VEHICLE (.17 PER MILE) 44.03

STATE AGENCY VEHICLE (17 PER MILE) 149.94

PRIVATE VEHICLE (PER MILE) ..... -

NUMBER OF BOATS USED IN INVESTIGATION: 1

TYPE(S) OF BOAT(S) USED IN INVESTIGATION (LIST BELOW):

1. Canoe
2.
3.

TOTAL EXPENSE FOR BOAT USE 36.25

TOTAL NUMBER OF NIGHTS SPENT IN FIELD FOR ALL PARTICIPANTS: 0

TOTAL EXPENSE FOR LODGING ..... -

TOTAL NUMBER OF MEALS FOR ALL PARTICIPANTS: 16

TOTAL EXPENSE FOR MEALS 56.26

TOTAL EQUIPMENT EXPENSES (SORBENTS, BOOMS, HAY, ETC.)..... -

TOTAL EXPENSES FOR MISCELLANEOUS ITEMS: (ICE, FILM, TOLLS, ETC.)..... -

TOTAL EXPENSES ..... $ 1,383.14

EFFECTIVE DATE: July 1980 SIGNATURE: Richard W Fryer

DATE: 9-18-80

100166

Piney River/Tye River

Sheet No. 1

REPLACEMENT COST OF FISH

Fish Kill No. 81-002

Species & Common Name	Size (Inches)	Number	Individual Value	Total Value
Lepomis sp	1	9	.11	.99
Sunfish	2	53	.17	9.01
	3	62	.23	14.26
	4	114	.29	33.06
	5	53	.40	21.20
	6	70	.68	47.60
	7	9	1.14	10.26
Ambloplites rupestris	5	9	1.14	10.26
Rock Bass	6	9	1.43	12.87
Ictaluris punctatus				
Channel Catfish	22	9	1.14	10.26
Aphredoderus sayanus				
Pirate perch	All	18	.11	1.98
Cyprinidae				
Minnows	All	46,076	.03	1,382.28

Sub-total $1,554.03

Grand Total _____ _____

Signed: Jack M. Hanson
(Chief, Fish Division, CGIF)

Date: August 12, 1980

Form 36-75

100167

REPLACEMENT COST OF FISH

Fish Kill No. 81-002

Species & Common Name	Size (Inches)	Number	Individual Value	Total Value
Noturus sp.				
Madtoms	All	924	.11	101.64
Etheostoma sp.				
Darters	All	1364	.11	150.04
Catostomidae	1-3	1751	.06	105.06
Suckers	4-6	510	.11	56.10
	7-8	202	17	34.34
	9-10	273	.23	62.79
	12+	422	.34	143.48
Micropterus dolomieui	1	9	.29	2.61
Smallmouth Bass	2	616	.57	351.12
	3	572	.85	486.20
	4	53	1.14	60.42
	5	88	1.43	125.84
	6	255	1.71	436.05
	7	53	1.99	105.47
	8	150	2.28	342.00
			Sub-total	$2,563.16

Grand Total _____ _____

Signed: _____
(Chief, Fish Division, CGIF)

Date: August 12, 1980

Form 36-75

100168

REPLACEMENT COST OF FISH

Fish Kill No. 81-002

Species & Common Name	Size (Inches)	Number	Individual Value	Total Value
Smallmouth Bass	9	9	2.57	23.13
	10	123	2.85	350.55
	11	9	3.13	28.17
	12	9	3.42	30.78
	13+	9	3.99	35.91
Cyprinus carpio	1-6	44	.06	2.64
Carp	7-9	35	.11	3.85
	10-11	9	.17	1.53
	14	9	.23	2.07
			Sub-total	$478.63

Grand Total $4,595.82

Signed: Jack M. McLaren
(Chief, Fish Division, CGIF)

Date: August 12, 1980

100169 Form 36-75

LABORATORY COSTS

Fish Kill No. 81-002

RECEIVED
SEP 16 1980
DIV. CON. LAB. SERV.
ENVIRONMENTAL LAB

PARAMETER	no. of analyses	cost per analysis	total cost	PARAMETER	no. of analyses	cost per analysis	total cost
Coliform, Total /100 ml				Arsenic			
Coliform, Fecal /100 ml				Cadmium	1	.55	.55
pH (Laboratory)	1	1.00	1.00	Calcium			
Alkalinity	1			Chromium	1	.55	.55
Total Solids, Total				Copper	1	.55	.55
Volatile				Iron	1	.55	.55
Fixed				Lead	1	1.40	1.40
Suspended Solids, Total	1	2.20	2.20	Magnesium			
Volatile	1			Manganese			
Fixed	1			Mercury	1	1.65	1.65
Dissolved Solids				Zinc	1	.55	.55
Chloride	1	1.00	1.00	Nickel	1	.55	.55
Hardness							
Nitrogen, Total Kieldahl	1	5.50	5.50				
Phosphorus, Total	1						
Phosphorus, Ortho	1						
Ammonia mg/l as N	1			Turbidity			
Nitrite mg/L as N	1			Pesticides			
Nitrate mg/L as N	1			Settleable Solids			
Sulphate	1	1.50	1.50	Conductivity			
Hexane Extractables							
BOD5	1	4.75	4.75				
COD							

Effective date 8-1-80

Grand Total $22.30

Approved by D. Mason 9-16-80
(Authorized Signature)

AR100170

100170

EQUAL'S EXPENSE

FIELD INVESTIGATION

To: Richard Ayers

POLLUTION COMPLAINT NO. 81-015 FISH KILL NO. [illegible]

NAME: J. A. Frome, III

TITLE: Pollution Control Engineer

WAGE EARNINGS PER HOUR AT TIME OF INVESTIGATION [illegible]

TOTAL MAN-HOURS IN FIELD ~ 34.5
AND/OR REPORT WRITING
TOTAL WAGE EXPENSE BASED ON HOURLY RATE 511.75

TYPE OF VEHICLE USED BY YOU PERSONALLY (AGENCY, POOL, OR PRIVATE)
TOTAL MILEAGE 653 COST PER MILE [illegible]

TOTAL EXPENSE FOR VEHICLE USE 111.01

TYPE OF BOAT USED BY YOU PERSONALLY _____

RATE FOR BOAT USE:	DAILY COST	HOURLY OPERATING COST
CANOE AND FLATBOTTOM (NARROW)	$ 6.25	$ 3.00
WIDE FLATBOTTOM	8.50	4.00
GLASSMASTER 17' OUTBOARD	15.00	6.50
GLASSMASTER 19' OUTBOARD	25.00	7.50
GLASSMASTER 19' INBOARD	31.00	8.50
CAROUSEL	31.00	8.50
FISH/SKI, T-CRAFT	37.00	9.00

NUMBER OF DAYS BOAT WAS USED _____
NUMBER OF HOURS BOAT WAS USED _____ TOTAL EXPENSE FOR BOAT USE ..... [illegible]

TOTAL NUMBER OF NIGHTS SPENT IN FIELD _____
TOTAL EXPENSE FOR LODGING .....
TOTAL NUMBER OF MEALS 3
TOTAL EXPENSE FOR MEALS .....

EQUIPMENT USED (SOLVENTS, HAY BALES, WIRE, BOOMS, ETC.) ITEMIZE BELOW.

ITEM(S)	COST PER UNIT	TOTAL COST

TOTAL EXPENSE FOR EQUIPMENT 0

MISCELLANEOUS ITEMS (ICE, FILM, TOLLS, ETC.) ITEMIZE BELOW:

TOTAL EXPENSE FOR MISCELLANEOUS ITEMS 0

EFFECTIVE DATE: _____ TOTAL EXPENSES 622.23

SIGNATURE: _____

DATE: _____

100171

...S EXPENSE

INVESTIGATION

...LUTION COMPLAINT NO. 81-015 FISH KILL NO. 81-002

NAME: DWIGHT M. SOUKS

TITLE: Pollution Control Specialist

...AGE EARNINGS PER HOUR AT TIME OF INVESTIGATION 7.27

TOTAL MAN-HOURS IN FIELD and/or REPORT WRITING 15 1/2

TOTAL WAGE EXPENSE BASED ON HOURLY RATE 112.74

TYPE OF VEHICLE USED BY YOU PERSONALLY (AGENCY, POOL, OR PRIVATE)
TOTAL MILEAGE — COST PER MILE —

TOTAL EXPENSE FOR VEHICLE USE ..... —

TYPE OF BOAT USED BY YOU PERSONALLY —

RATE FOR BOAT USE:	DAILY COST	HOURLY OPERATING COST
CANOE AND FLATBOTTOM (NARROW)	$ 6.25	$ 3.00
WIDE FLATBOTTOM	8.50	4.00
GLASSMASTER 17' OUTBOARD	15.00	6.50
GLASSMASTER 19' OUTBOARD	25.00	7.50
GLASSMASTER 19' INBOARD	31.00	8.50
CAROUSEL	31.00	8.50
FISH/SKI, T-CRAFT	37.00	9.00

NUMBER OF DAYS BOAT WAS USED —
NUMBER OF HOURS BOAT WAS USED — TOTAL EXPENSE FOR BOAT USE ..... —

TOTAL NUMBER OF NIGHTS SPENT IN FIELD —
TOTAL EXPENSE FOR LODGING ..... —
TOTAL NUMBER OF MEALS 3
TOTAL EXPENSE FOR MEALS ..... $ 10.22

EQUIPMENT USED (SOLVENTS, HAY BALES, WIRE, BOOMS, ETC.) ITEMIZE BELOW:

ITEM(S)	COST PER UNIT	TOTAL COST

TOTAL EXPENSE FOR EQUIPMENT ..... —

MISCELLANEOUS ITEMS (ICE, FILM, TOLLS, ETC.) ITEMIZE BELOW:

TOTAL EXPENSE FOR MISCELLANEOUS ITEMS ..... —

EFFECTIVE DATE: 8/4/80 TOTAL EXPENSES $122.24

SIGNATURE: Dwight M. Souks

DATE: 8/4/80 100172

INDIVIDUAL'S EXPENSE

FISH KILL INVESTIGATION

FISH KILL NO. 81-002

NAME: Richard Ayers

TITLE: PC Spec. B

Present wage earnings per hour: 10.08

Total man-hours in field, laboratory and report preparation: 34

Total wage expense based on hourly rate ..... #342.7-

Total number of miles driven by state car personally: 229

Total mileage expense for use of state agency, pool car (17¢ per mile): ..... #38.93

Total number of miles driven by private car personally: _____

Total mileage expense for use of private car (per mile): ..... —

Total expense for travel by train, plane or bus: ..... —

Type of boat used by you personally: Canoe

Rate for boat use:	Daily Cost	Hourly operating cost
Canoe and Flatbottom (narrow)	$ 6.25	$ 3.00
Wide Flatbottom	8.50	4.00
Glassmaster 17' Outboard	15.00	6.50
Glassmaster 19' Outboard	25.00	7.50
Glassmaster 19' Inboard	31.00	8.50
Carousel	31.00	8.50
Fish/Ski, T-Craft	37.00	9.00

Number of days boat was used: 1

Number of hours boat was used: 10

Total expense for boat use: ..... #36.25

Total number of nights spent in field: _____

Total expense for lodging: ..... —

Total number of meals: 4

Total expense of meals: ..... #12.80

Miscl. items (ice, film, tolls, etc.) Itemize below:

(No. of items) (Total value)

Total expense for Miscl. items: ..... —

TOTAL EXPENSES #430.70

Effective date: 7-13-80

Signature Richard W Ayers

Date 8-4-80

100173

INDIVIDUAL'S EXPENSE

FIELD INVESTIGATION

PC JTION COMPLAINT NO. _____ FISH KILL NO. 81-002

NAME: DAVID P. CHANCE

TITLE: P.C. SPECIALIST B

WAGE EARNINGS PER HOUR AT TIME OF INVESTIGATION 9.63

TOTAL MAN-HOURS IN FIELD 28

TOTAL WAGE EXPENSE BASED ON HOURLY RATE $269.64

TYPE OF VEHICLE USED BY YOU PERSONALLY (AGENCY, POOL, OR PRIVATE)
TOTAL MILEAGE 259 COST PER MILE .17

TOTAL EXPENSE FOR VEHICLE USE $44.03

TYPE OF BOAT USED BY YOU PERSONALLY _____

RATE FOR BOAT USE:	DAILY COST	HOURLY OPERATING COST
CANOE AND FLATBOTTOM (NARROW)	$ 6.25	$ 3.00
WIDE FLATBOTTOM	8.50	4.00
GLASSMASTER 17' OUTBOARD	15.00	6.50
GLASSMASTER 19' OUTBOARD	25.00	7.50
GLASSMASTER 19' INBOARD	31.00	8.50
CAROUSEL	31.00	8.50
FISH/SKI, T-CRAFT	37.00	9.00

NUMBER OF DAYS BOAT WAS USED —
NUMBER OF HOURS BOAT WAS USED — TOTAL EXPENSE FOR BOAT USE ..... —

TOTAL NUMBER OF NIGHTS SPENT IN FIELD 0
TOTAL EXPENSE FOR LODGING ..... —
TOTAL NUMBER OF MEALS 6
TOTAL EXPENSE FOR MEALS $20.00

EQUIPMENT USED (SOLVENTS, HAY BALES, WIRE, BOOMS, ETC.) ITEMIZE BELOW:

ITEM(S)	COST PER UNIT	TOTAL COST

TOTAL EXPENSE FOR EQUIPMENT ..... —

MISCELLANEOUS ITEMS (ICE, FILM, TOLLS, ETC.) ITEMIZE BELOW:

TOTAL EXPENSE FOR MISCELLANEOUS ITEMS ..... —

EFFECTIVE DATE: July '80 TOTAL EXPENSES $333.67

SIGNATURE: David P Chance

DATE: July 14, 1980

100174

Virginia State Water Control Board
P.O. Box 11143, Richmond, Va. 23230

JUL 30 1980

FIELD AND LABORATORY DATA

To: Richard Ayers - DE
13533 Jul 12,

FK SS PC BM PS BIO GW: X

LATITUDE:

FK, SS, PC, PS, BM, OR BIO NO.:

LONGITUDE:

BASIN | STREAM | RIVER MILE | LG CO ADP

Collect for: Fromel

Collected by: Fromel

Name of Stream: Tye River

Station Description: upstream from Rt. 225 Bridge

LABORATORY NUMBER | DEPTH | SECTION | REGION

MONTH | DAY | YEAR: 07 11 80

TIME: 1630

SOURCE

IDE | % FLB | FLOW CFS | WEATHER | TEMP °C

DISSOLVED OXYGEN | DO% SAT | FIELD pH

Cl_2 RESIDUAL(TOTAL)

PARAMETER	STAT CODE	VALUE	PARAMETER	STAT CODE	VALUE
pH (Laboratory)	050	6.5	Arsenic (mg/l)	058	
Alkalinity/Acidity (mg/l as $CaCO_3$)	022/021	8	Cadmium (mg/l)	078	
Total Solids,Total (mg/l)	024		Calcium (mg/l)		
Volatile	025		Chromium (mg/l)		
Fixed	026		Copper (mg/l)		
Suspended Solids,Total (mg/l)	027	28	Iron (mg/l)	044	
Volatile	028	3	Lead,Total (mg/l)	043	
Fixed	029	25	Magnesium (mg/l)	216	
Dissolved Solids,Total (mg/l)	067		Manganese (mg/l)	026	
Settleable Solids (mg/l)	023		Mercury,Total (mg/l)	080	
Chloride (mg/l)	033	2	Zinc (mg/l)	041	
Hardness,EDTA (mg/l as $CaCO_3$)	032		Sodium (mg/l)	106	
Nitrogen,Total Kjeldahl (mg/l)	035	0.2	Potassium (mg/l)	105	
Phosphorus,Total (mg/l)	065	0.1	Nickel (mg/l)	068	
Phosphorus,Ortho (mg/l)	061	0.03	Fluoride (mg/l)	095	
Ammonia (mg/l as N)	036	0.1	Total Coliform/100 ml - MF	020	
Nitrite + Nitrate (mg/l as N)	094	0.31	Fecal Coliform, 100 ml - MF	055	
Nitrite (mg/l as N)	057	0.01	Total Coliform/100 ml - MPN	020	
Sulphate (mg/l)	107	8	Fecal Coliform/100 ml - MPN	055	
Freon Extractables (mg/l)	048				
BOD_5 (mg/l)	010	10	Conductivity (micro - mhos/cm)	034	
DO (mg/l)	051		Turbidity, NTU	070	
Total Organic Carbon (mg/l)	680		Pesticides	121/122	

RECEIVED
AUG 1 1980
VALLEY REGIONAL OFFICE

Date released from Lab: JUL 29 80

Chemist: S. R. Pitts

100175

To: Richard Ayers
From: Joe Fromal

FIELD AND LABORATORY DATA

JUL 12 90

BASIN	STREAM	RIVER MILE	LG CD ADP

LABORATORY NUMBER	DEPTH	SECTION	REGION
			6

MONTH DAY YEAR	TIME	SOURCE

Collect for: Fromal

Collected by: Fromal

Name of Stream:

Station Description:

RECEIVED
AUG 13 1990
VALLEY REGIONAL OFFICE

Parameter	Code	Value		Parameter	Value	Code
[illegible]	[illegible]			[illegible]		
[illegible]	[illegible]			[illegible]		
Volatile	025			[illegible]		[illegible]
Fixed	026			Copper		[illegible]
Suspended Solids,Total (mg/l)	027			Iron (mg/l)		[illegible]
Volatile	028			Lead,Total (mg/l)		013
Fixed	029			Magnesium (mg/l)		246
Dissolved Solids,Total (mg/l)	067			Manganese (mg/l)		096
Settleable Solids (mg/l)	023			Mercury,Total (mg/l)		030
Chloride (mg/l)	033			Zinc (mg/l)		041
Hardness,EDTA (mg/l as $CaCO_3$)	032			Sodium (mg/l)		105
Nitrogen,Total Kjeldahl (mg/l)	035			Potassium (mg/l)		103
Phosphorus,Total (mg/l)	065			Nickel (mg/l)		[illegible]
Phosphorus,Ortho (mg/l)	064			Fluoride (mg/l)		007
Ammonia (mg/l as N)	036			Total Coliform/100 ml - MF		[illegible]
Nitrite + Nitrate (mg/l as N)	091			Fecal Coliform/100 ml - MF		055
Nitrite (mg/l as N)	[illegible]			Total Coliform/100 ml - MPN		[illegible]
Sulphate (mg/l)	[illegible]			Fecal Coliform/100 ml - MPN		055
[illegible]	[illegible]					
[illegible]	[illegible]			[illegible]		[illegible]
[illegible]				[illegible]		[illegible]
[illegible]						

AR100176

100176

APPENDIX A

MEMORANDUM

State Water Control Board

2111 North Hamilton Street | P. O. Box 11143 | Richmond, VA. 23230

SUBJECT: Nelson County - FK 81-002 (PC 81-018)-Piney & Tye River Fish Kill

TO: → VRO PReP File

FROM: J. A. Fromal, III

DATE: 15 July 1980

COPIES: PReP Coordinator
VRO File #20-1174/T.H. Jett

At 12:30 p.m. on 11 July 1980, the writer received a call from PReP Central concerning a fish kill on Piney River. The call originated from a Nelson County Game Warden who placed a call to the Nelson County Sheriff's Office. Mr. Evans then relayed the information to Richmond.

The writer called the Sheriff's Office to further define the location and extent of the kill. The office representative said the kill was on Piney River and was caused by the plant (U.S. Titanium) and that an estimate of fish killed was difficult because the river was too muddy.

The writer left for Nelson County @1:00 p.m. The results of the investigation at the Titanium plant site are as follows:

1. The pump sump pond had recently overflowed.

2. There was approximately 6" of freeboard in the pump sump pond at the time of the inspection.

3. ½ mile downstream of the company's corrugated metal stormwater outfall, a large turtle and a number of frogs were seen. No fish or minnows live or dead were noted. The inspection was made from a railroad track located adjacent to the river.

The writer then contacted the Sheriff's Office again to make sure that there was not another location specified by the game warden. The individual at the office stated that the Game Warden had found dead fish @ the Route 739 Bridge on the Tye River. The results of the Tye River inspection are as follows:

1. A dead sucker was noted upstream of the Route 739 Bridge, so the writer began walking the river bank heading upstream for 200 yards. A rough estimate of the preliminary count was 50 minnows and 8 - 10 fish of 4 to 12 inches. The fish were not bloated. A live mudtom and tadpole were noted in backwash near the bank.

2. The writer took metal and nutrient samples just upstream of the bridge at 4:30 p.m. The pH was tested with a HACH Kit and found to be 7.0 standard units.

3. A man was fishing under the bridge. He stated he had not seen any dead fish, hadn't gotten many bites, and had caught a 3 inch mudtom.

100177

4. The river was fairly turbid from recent rains.

5. A 12" fish was wrapped in foil and taken back to the warehouse and frozen.

6. A local farmer said that I was welcome to go on his property and look at the river. At the railroad bridge in a pool area, 5 suckers (approx. 12") and 15 minnows, all dead, were noted. The writer then went upstream approximately 0.15 miles to a sand and gravel bar and noted 1 dead minnow and 1 live tad pole.

7. From the Route 29 Bridge what appeared to be a dead minnow was noted.

The writer arrived home at 7:00 p.m. and called Ray Tesh to see which way to proceed. He said as the fish were not bloated, the kill was fairly recent (24 hours). He suggested that DES be contacted concerning a count.

Richard Ayers said a count should be made and requested that an extra person accompany the writer so that two teams could be used. The writer contacted D.M. Sours who agreed to assist.

The VRO team arrived at a grocery store near U.S. Titanium at 9:30 a.m. on 12 July 1980 and met Richard Ayers and Dave Chance. It was decided that fish would be counted for 100 yards every ½ mile. The team of Chance-Sours would count stations 1 - 12 and Ayers-Fromal would count from Station 13 to end of kill (see attached topo). Stations 1 thru 20 were completed on the 12th. It was decided that Ayers-Chance would check the extent of the kill at the Route 654 bridge while Sours-Fromal checked downstream to find the length of the kill.

The Tye River was checked at the confluence of Rucker Run and no dead fish were found. The River was extremely muddy. At that point, further counting was found to be more advantageous from a canoe. The count would proceed again on the 13th.

On the 13th the count was completed around 4:00 p.m. by Chance-Ayers. The canoe was placed in the water at Station 20 and the team floated to the confluence of Ruckers Run. The source of the muddy water was the Buffalo River.

Tedd Jett is to write a memo concerning contacts made with U.S. Titanium and Ayers-Chance will supply final fish count.

It is suggested that:

1. A key to the Titanium property be supplied to the VRO staff to simplify investigations, and

2. Permanent fish kill investigation stations and procedures be established as this is a repetitive problem.

JAF:jf

100178


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
RIVER
Saunders Pond
Hubbard
Roses Mill
(3) ARRINGTON TOPO
Kingswood
Arrington
Naked
AMHERST
Gedoge Mtn
SOUTHERN
New
Creek
IF-2.10

APPENDIX B

MEMORANDUM

State Water Control Board

2111 North Hamilton Street | P. O. Box 11143 | Richmond, VA. 23230

SUBJECT: U.S. Titanium Corporation, Piney River, Virginia
Investigation of FK81-002 (PC 81-018)

TO: VRO File #20-1147

FROM: Tedd H. Jett

DATE: 14 July 1980

COPIES: VRO PReP File
PReP Coordinator, Richmond
BAT, Richmond
BE, Richmond
J. A. Fromal

On 12 July 1980 the writer was contacted by R.F. Tesh and informed of a fish kill investigation which was under way in the Piney and Tye Rivers in Nelson County below the subject plant site. The writer was asked to assist by contacting the Company to determine if problems with the waste holding facilities were continuing and to have local representatives visit the site and take appropriate corrective actions.

First, the writer called Billy Thompson of Piney River, who performs a monitoring function of the facilities on behalf of the Company. Mr. Thompson indicated that to the best of his knowledge no problems with the system had been experienced recently. Large thunderstorms occurred in the area on Wednesday and Thursday nights, 9 & 10 July 1980. Mr. Thompson observed the system after the first storm on 9 July 1980 and reported that both pumps were in operation and no discharge was occurring. He further indicated that there was no apparent evidence that any discharge had occurred earlier and that the catch basin was "empty". Mr. Thompson did not check the system after the 10 July 1980 storm but suggested that the writer check with Mr. Jack Campbell, who is responsible for operation and maintenance of the system, for further information.

The writer then called Jack Campbell for further details. Mr. Campbell advised first that his son, Bruce Campbell, had primary responsibility for the system and that he assisted him as needed. Mr. Campbell reported that a discharge from the system had occurred on Thursday night, 10 July 1980, as a result of the two thunderstorms mentioned earlier. Mr. Campbell and his son were on site Thursday evening when the storm hit. Both pumps were operating properly, but they could not keep the level in the catch basin from rising to the point where a discharge occurred. Mr. Campbell estimated that the discharge began around 5:00 p.m. and continued until about 11:00 p.m. The Campbells returned to the site around 10:30 p.m. on 10 July 1980 after the rain stopped and observed that the discharge volume was much reduced and the pond level was nearly back within the berm. Mr. Campbell checked the system again on Friday evening, 11 July 1980 and observed that the pond level was approximately 12" below the crest of the berm. Mr. Campbell also advised that the pond had been pumped dry prior to the storm on 9 July 1980 and that no discharge had occurred on that day. The discharge which did occur on 10 July 1980 was over the emergency spillway and resulted in no structural damage to the catch basin berms according to Mr. Campbell. He also indicated that no

mechanical malfunctioning of the pumping equipment was involved. The writer requested that Mr. Campbell inspect the system again on 12 July 1980 and assure that all necessary precautions are taken to avoid a recurrence. Mr. Campbell agreed to inspect the facilities at once.

The writer then attempted to contact John Drew, of the Stone Foundation, at home, to advise him of the situation. Mr. Drew could not be reached until Monday, 14 July 1980. On that day, the writer advised Mr. Drew of the events of the past weekend. The writer also suggested that the company make arrangements at once to dredge the catch basin to increase its holding capacity to the maximum possible.

THJ:jf

MEMORANDUM

State Water Control Board

2111 North Hamilton Street | P. O. Box 11143 | Richmond, VA. 2323

SUBJECT: FK 81-086 Piney and Tye Rivers Nelson Co.

TO: Fish Kill File

FROM: R. W. Ayers RWA

DATE: August 26, 1981

COPIES:

On May 19 and 20, 1981 a fish kill occured in the Piney River below the U.S. Titanium property in Nelson County and in the Tye River below the confluence of the Piney. A total of 2,482 fish were killed including: Suckers, Minnows, Sunfish, Smallmouth bass, and Madtoms. The game commission has assigned a replacement value of $311.39 to these fish. Cost of investigaiton was $664.46, lab cost was $17.30 and administrative costs were $25.00, bringing the total cost for the fish kill to $1,018.15.

The laboratory data do not show toxic levels of metals or sulfates in the Piney or Tye Rivers because they were collected two days after the kill occured. The data from the U.S. Titanium discharge do exceed toxicity values for some metals, however it is unlikely that such a small flow volume could have been responsible for a fish kill 10 miles downstream.

The circumstances of this kill are similar to those which have occured in the past in this area. Severe thunderstorms passed thru the area on May 18 and 19, 1981. These storms probably caused a considerable amount of acidic runoff, bearing sulfates and heavy metals, from the U.S. Titanium property into the Piney River, thus causing the kill downstream. By the time samples were collected on May 20, the slug of toxic materials had already passed downstream. (See Attached Memo From J. A. Fromal, III)..

PLAINTIFF'S EXHIBIT 332

100182

FISH KILL REPORT/NOTIFICATION

Fish Kill Number 81-086 City/County Nelson Co.

Stream Piney and Tye Rivers Date Investigated 5/22 & 23/81

Basin James River Investigator J. A. Fromal, III

Region Valley

Reported by: Name Robert Parton

Address

Phone (804) 263-5512

Reported to: Name Ms. Lamplee

PReP Central

Fish Killed (common name) Suckers, Bass, Minnows Date Kill Started Probably 5/19/81

Number Killed 2482 Date Kill Ended Probably 5/20/81

Length/area Involved @ least 11 miles Total Cost Investigation 664.46 + $17.30 lab cos

311.39 fish co

Cause of Kill Unknown - Suspect runoff Man Hours 55 -25.00 admin c

from U.S. Titanium Property $1018.15 total

Exact Location of Kill Piney River 2 miles below U.S. Titanium to at least 11 miles below discharge on the Tye River

Other: See attached memo.

Date 5/28/81 Investigators Signature *[signature]* For Joe Fromal

Recommendations:

Division of Ecological Studies Lab data indicate samples of river taken after toxic slug had passed. Circumstances similar to past kills caused by run-off from U.S. Titanium.

Date 7/21/81 Signature *[signature]*

Enforcement:

Date Signature

Fish Kill Distributed (Date)

100183

7 Copies: DES, BSFS Dir., Enf., Region, CGIF, HATS File, Fish Kill File (orig)

Form 12-74

MEMORANDUM

State Water Control Board

1111 North Hamilton Street P. O. Box 11143 Richmond, VA 23230

SUBJECT: FK81-086 (PC81-667) -Nelson County - Tye River

TO: VRO PReP File

FROM: J. A. Fromal, III

DATE: 28 May 1981

COPIES: →PReP Coordinator, Richmond
VRO File #20-1147 (U.S. Titanium)
T. H. Jett

At 4:30 p.m. on 22 May 1981 the writer received a complaint from the PReP coordinator concerning a fish kill in the Tye River. The complaint was registered by Mr. Robert Parton (804-263-5512) who was immediately contacted by the writer. He had noticed 12 inch dead fish (bass and suckers) approximately 1½ miles downstream of the Route 739 bridge at the Tye River. He also stated that the river showed a propensity to foam.

The writer drove to the Route 739 bridge, arriving around 6:00 p.m. Mostly large dead suckers were noted, however, there was one dead bass, which eliminated spawning stress or disease. Nutrient and metals samples were taken. The stream pH by the HACH method was 7.0. Live fish were noted in the backwash area.

The storm water outfall from U.S. Titanium was inspected around 7:00 p.m. The low lying area just upstream of the outfall appeared to be very muddy. The discharge was sampled for metals and had a pH of less than or equal to 4.5.

The Piney River was inspected at the guaging station. No dead fish were noted. The people who live next to the river at that location, were asked if they had noticed any dead fish recently and they said no.

The operator of the Wheeler's Fast Food Mart was asked if there had recently been any rainfall in the area. She said it rained very heavily on Monday and Tuesday with a light drizzle on Wednesday (May 18, 19 and 20, respectively).

The writer contacted Dave Chance and it was decided that a count should be taken beginning the next morning (the 23rd). There were two teams counting fish:

No. 1 - Dave Chance and Dwight Sours
No. 2 - Brian Harrison and Joe Fromal

To quickly ascertain the degree and extent of the fish kill, it was decided that fish counting stations would be set @ 1 mile increments and the count would be made for 100 yds. Initially 8 stations would be counted: 1-4 by team No. 1 and 6-8 by Team No. 2. The results of the count are attached.

Following a discussion during lunch by all parties concerned, it was decided to check Station 5 and just upstream of the confluence of the Piney and Tye on both rivers. No dead fish were found. Live fish and minnows were noted below the confluence.

Stations 9 and 10 were then counted. As the numbers of dead fish were small, the teams went to the Route 654 at which point the fish count was terminated. The reasons for the termination are as follows:

1. The kill was determined by Dave Chance to be at least three days old which corresponded with the aforementioned rain event.

2. The numbers of dead fish were such that Mr. Chance felt that the fish could be lightly spread out to the James River.

3. The plug that killed the fish had long since passed thru the count area and only circumstantial evidence could be linked to any direct problem. (Sample results may change this conclusion).

The expense sheets for the staff representatives are attached.

JAF:jf

Summary - Fish Count - Tye River

STA.	Suckers 1-3	4-6	7-8	9-10	11-12	>12	Minnows	Other
1								
2	2						2	
3								
4								
5								
6	1(2)=2						16(2)=32	Sunfish(1½") (2) Tadpole 1(2)=2
7	1			1	2	1	5	Sunfish (3") S.M. Bass (6")
8	1(2)=2	3(2)=6		2(2)=4		2(2)=4	16(2)=32	
9		1		1	3	3	11	Sunfish (6") Madtoms (4") (5")2
10								Rock Bass (4") 2
Total	2(2)=4 9	3(2)=6 13	0	6	5	3(2)=6 14	1(2)=2 84	

Expanded Totals

Suckers	Minnows	Sunfish	Bass	Madtoms
1-3 = 158	1478	1½" = 35	4" = 35	4" = 18
4-6 = 229		3 " = 18	6" = 18	5" = 35
7-8 = 0		6 " = 18		
9-10= 106				
11-12= 88				
>12 = 246				

Grand Total Fish Kill = 2,482

100186

Comments/Station

1 - No fish observed, live or dead
2 - Heavy silt, north bank, new railroad bridge
3 - Right @ telephone line, good long (fairy deep) pool, no fish observed.
4 - Steve Martin - Attorney who knows situation, owns access point.
Another good pool - no live or dead fish observed, 1 live frog.
5 - No dead fish observed. Live fish noted below railroad bridge and river confluence.
6 - Many live tadpoles, tadpole may have been in distress, many dead minnows noted prior to initiation of counts. Tadpoles tended to eat the evidence. River had been up approximately 2 feet recently.
7 - Live minnows sighted. Small patches of foam noted. 1 live frog. Brown algae noted on bottom, may be dead.
8 - Foaming noted behind log. Live minnows noted.
9 - Live minnows observed. Dead fish in this area appear to be 2-4 days old.
10 - No comments.

Piney and Tye Rivers
Nelson Co.

Sheet No. 1

REPLACEMENT COST OF FISH

Fish Kill No. 81-086

Species & Common Name	Size (Inches)	Number	Individual Value	Total Value
Catostomidae -				
Suckers	1-3	158	.06	9.48
	4-6	229	.11	25.19
	9-10	106	.23	24.38
	11	88	.29	25.52
	> 12	246	.34	83.64
Cyprinidae-minnows	All	1478	.03	44.34
Lepomis sp.-Sunfish	2	35	.17	5.95
	3	18	.23	4.14
	6	18	.68	12.24
Micropterus dolomieui				
Smallmouth bass	4	35	1.14	39.90
	6	18	1.71	30.78
Ictaluridae-Madtoms	All	53	.11	5.83

Grand Total 2482 $311.39

Signed: Jack M Hoffman
(Chief, Fish Division, CGIF)

Date: August 7, 1981

100188

Form 36-75

VIRGINIA STATE WATER CONTROL BOARD

TOTAL COST SUMMARY - FIELD INVESTIGATION

POLLUTION COMPLAINT NO. 81-667 FISH KILL NO. 81-086

ITEMIZED BELOW ARE EXPENSES INCURRED BY THE VIRGINIA STATE WATER CONTROL BOARD DURING THE SUBJECT INVESTIGATION

NUMBER OF PERSONNEL IN SUBJECT INVESTIGATION: 4

TOTAL MAN-HOURS IN FIELD AND/OR REPORT WRITING: 55

TOTAL WAGE EXPENSE BASED ON HOURLY RATE FOR ALL PARTICIPANTS..... $497.19

TOTAL EXPENSE FOR LABORATORY 17.30

TOTAL NUMBER OF MILES DRIVEN BY: STATE POOL VEHICLE _____

STATE AGENCY VEHICLE 680

PRIVATE VEHICLE _____

TOTAL MILEAGE EXPENSE:

STATE POOL VEHICLE (PER MILE) ..... _____

STATE AGENCY VEHICLE (.20 PER MILE) $136.00

PRIVATE VEHICLE (PER MILE) ..... _____

NUMBER OF BOATS USED IN INVESTIGATION: —

TYPE(S) OF BOAT(S) USED IN INVESTIGATION (LIST BELOW):

1.

2.

3.

TOTAL EXPENSE FOR BOAT USE ..... —

TOTAL NUMBER OF NIGHTS SPENT IN FIELD FOR ALL PARTICIPANTS: —

TOTAL EXPENSE FOR LODGING ..... —

TOTAL NUMBER OF MEALS FOR ALL PARTICIPANTS: 7

TOTAL EXPENSE FOR MEALS 31.27

TOTAL EQUIPMENT EXPENSES (SORBENTS, BOOMS, HAY, ETC.)..... —

TOTAL EXPENSES FOR MISCELLANEOUS ITEMS: (ICE, FILM, TOLLS, ETC.)..... —

TOTAL EXPENSES $681.76

EFFECTIVE DATE: 5-23-81 SIGNATURE: Richard W Ayers

DATE: 8-25-81

100189

LABORATORY COSTS

Fish Kill No. 81-086

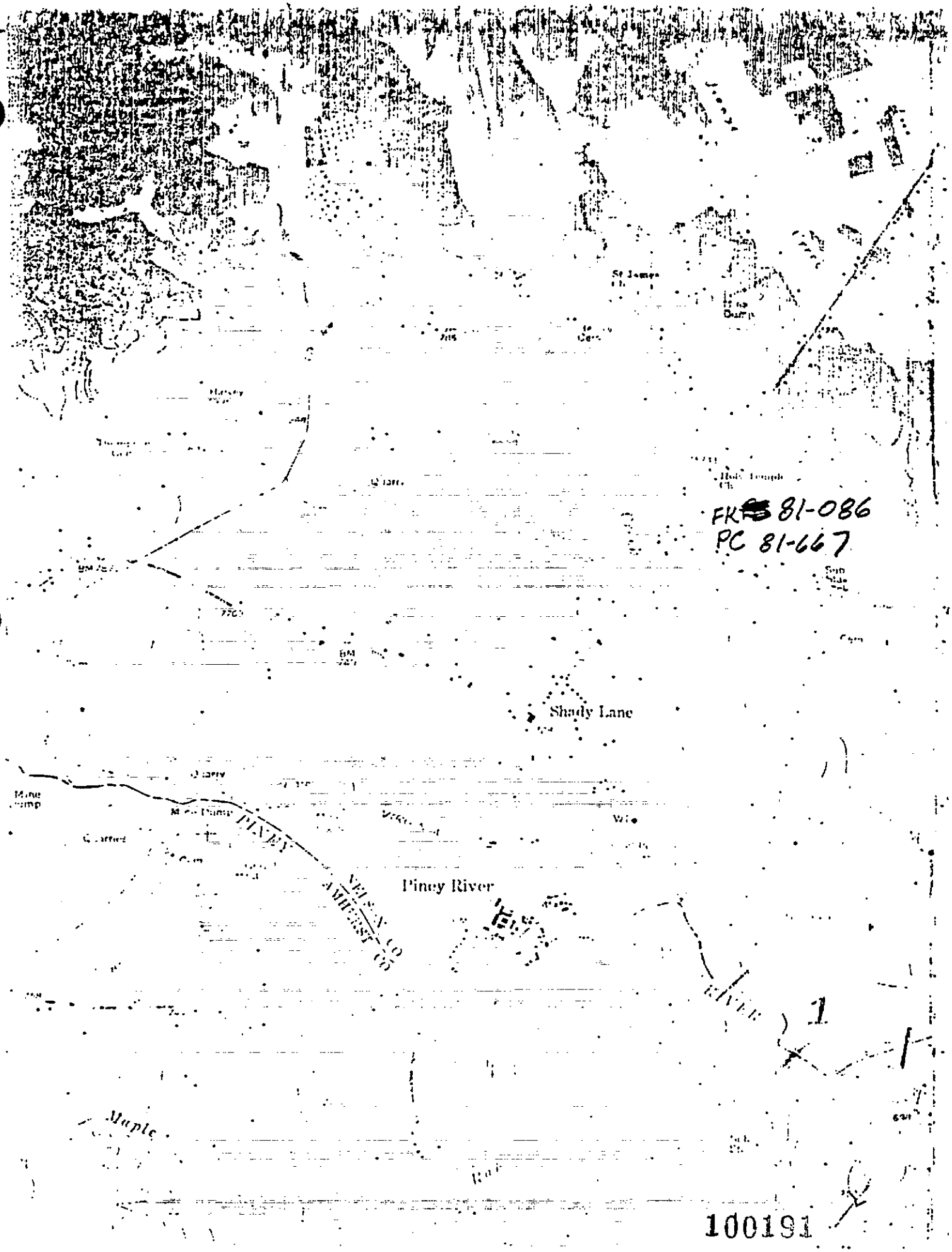
PARAMETER	no. of analyses	cost per analysis	total cost	PARAMETER	no. of analyses	cost per analysis	total cost
Coliform, Total /100 ml				Arsenic			
Coliform, Fecal /100 ml				Cadmium			
pH (Laboratory)	1	1.00	1.00	Calcium			
Alkalinity	1			Chromium	2	.55	1.10
Total Solids, Total				Copper	2	.55	1.10
Volatile				Iron	2	.55	1.10
Fixed				Lead	2	1.50	2.90
Suspended Solids, Total				Magnesium			
Volatile				Manganese			
Fixed				Mercury			
Dissolved Solids				Zinc	2	.55	1.10
Ioride	1	1.00	1.00	Nickel	2	.55	1.10
Hardness							
Nitrogen, Total Kjeldahl	1						
Phosphorus, Total	1						
Phosphorus, Ortho	1	5.50	5.50				
Ammonia mg/L as N	1			Turbidity			
Nitrite mg/L as N	1			Pesticides			
Nitrate mg/L as N	1			Settleable Solids			
Sulphate	1	1.50	1.50	Conductivity			
Hexane Extractables							
BOD5							
COD							

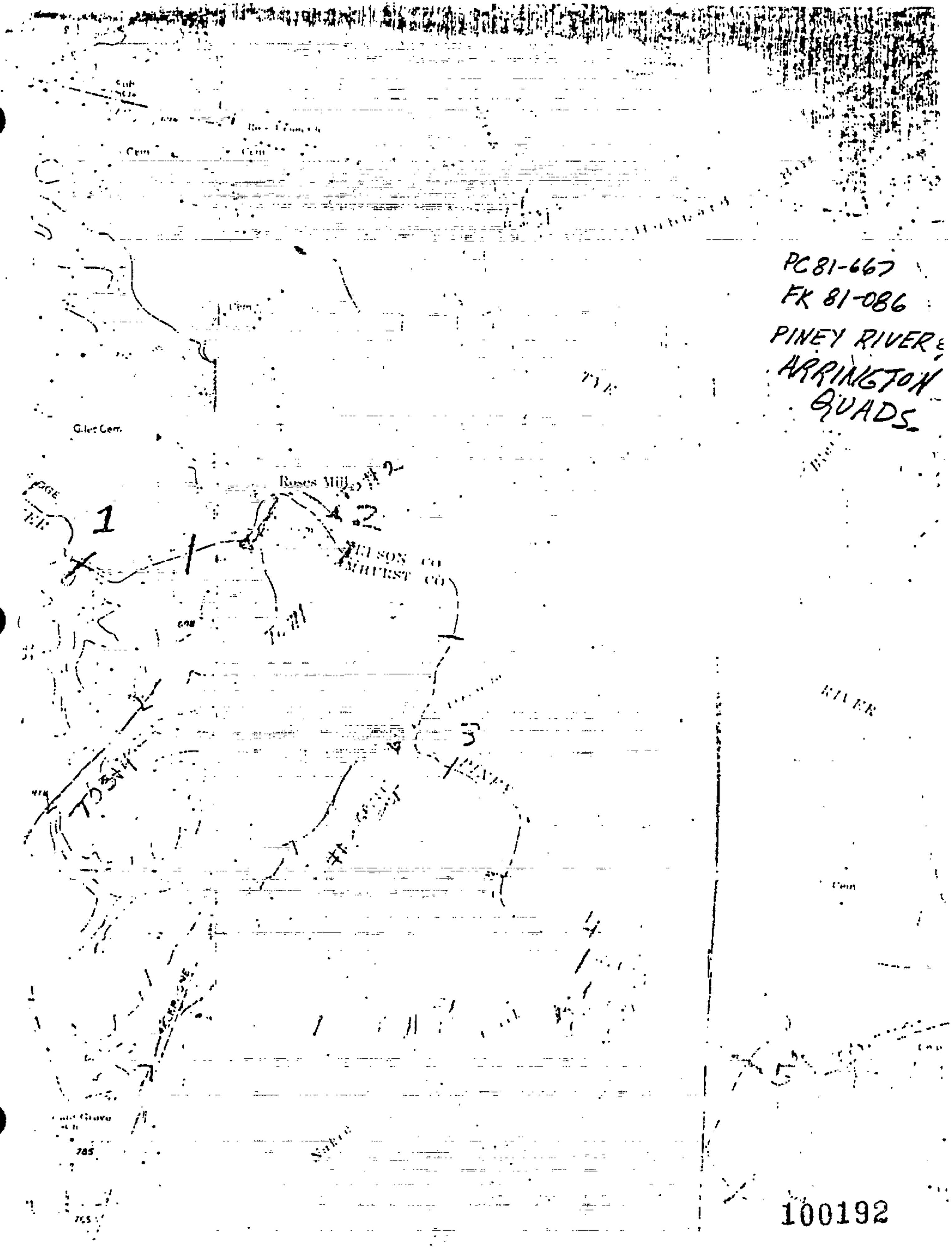
Effective date 6-15-81

Grand Total #17.30

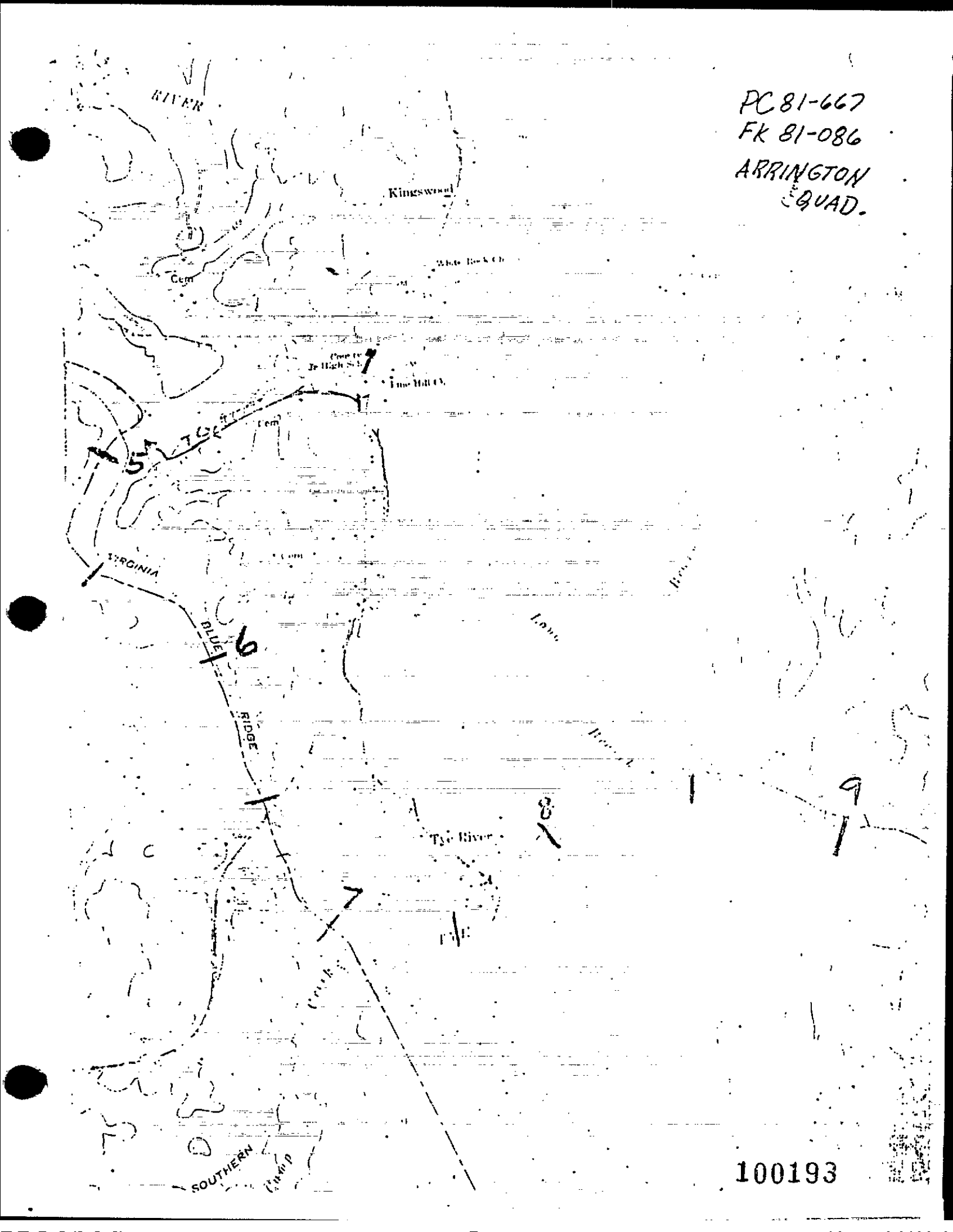
Approved by [signature] (Authorized Signature)

100190

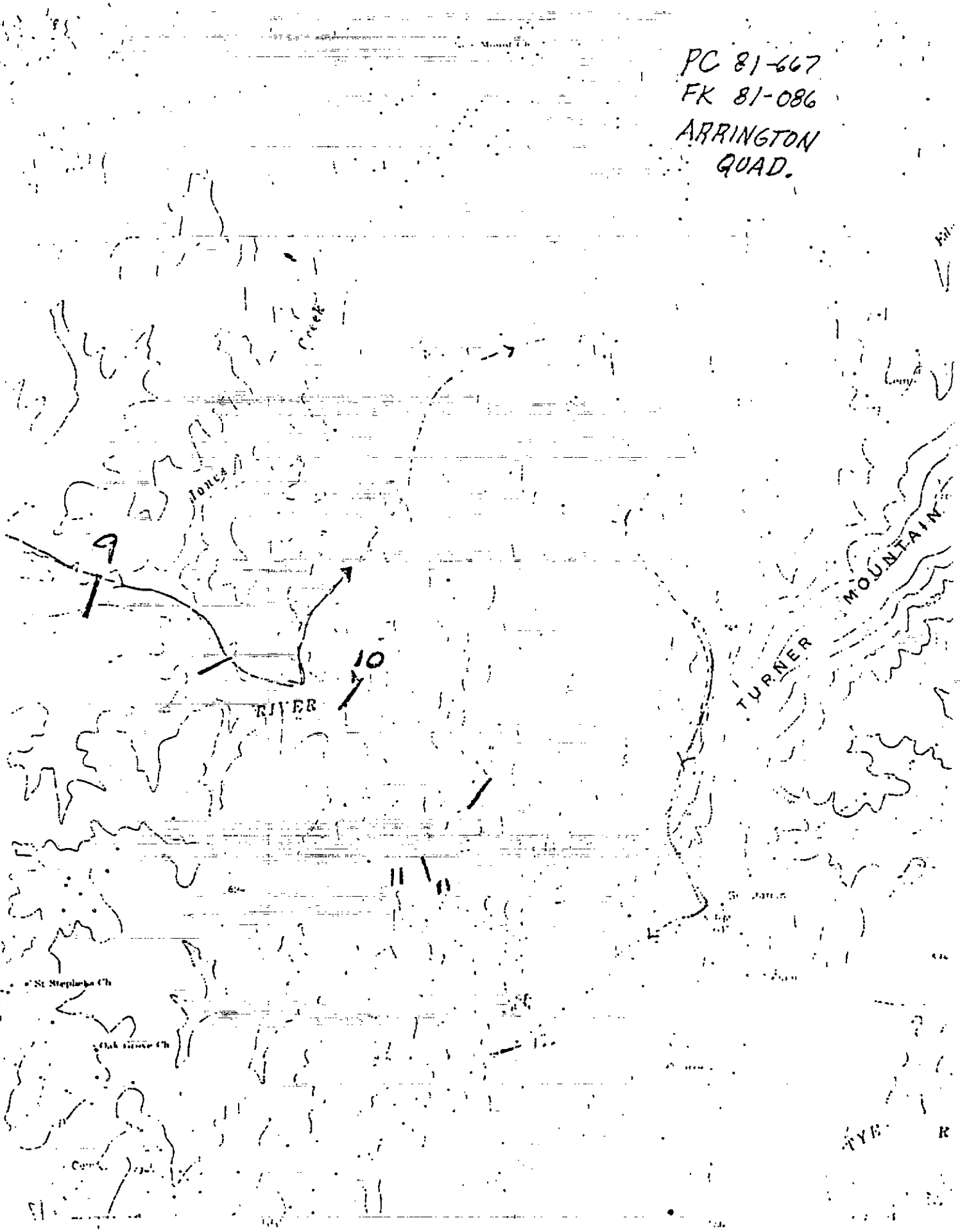

FR 81-086
PC 81-667
Shady Lane
Piney River
Maple
100191


PC 81-667
FK 81-086
PINEY RIVER &
ARRINGTON
QUADS
Giles Cem.
Roses Mill
1
2
3
4
5
Cem
RIVER

100192


PC 81-667
FK 81-086
ARRINGTON
QUAD.
RIVER
Kingswood
Cem
Cem
Cem
VIRGINIA
BLUE
RIDGE
Tye River
SOUTHERN
100193

PC 81-667
FK 81-086
ARRINGTON
QUAD.



P.O. Box 11143, Richmond, VA. 23230

FIELD AND LABORATORY DATA

JUN 25 1981

1 A | 2 B | 3 GW | 4 SS | 5 P | 6 PC | 7 FK: K

6

FK SS PC PS BM OR BIO NO.: 81-086

LATITUDE

LONGITUDE

To: Richard Ayers
From: Joe Froma / JUN 26 1981

BASIN | STREAM | RIVER MILE | FLOW SEVERITY (01351)

VALLEY REGIONAL

TIDE (00067) | % FRE (00082) | DEPTH (FT) | SECTION | REGION: 6

Collected by: Froma/

Waterbody: Tye River

Station Description: RT. 739 Bridge - Tye River

MONTH: 05 | DAY: 22 | YEAR: 81 | TIME: 0600 | SOURCE

DISSOLVED OXYGEN (00300) | FLOW CFS (00061) | WEATHER (00041) | TEMP °C (00010)

Cl_2 RESIDUAL (TOTAL) (50060) | FIELD pH: 7.0 (00400)

Team Name:

PARAMETER	STORET CODE	VALUE		PARAMETER	STORET CODE	VA
pH (Laboratory)	00403			COD (mg/l)	00340	
Alkalinity (mg/l as $CaCO_3$)	00410			Total Organic Carbon (mg/l)	00680	
Acidity (mg/l as $CaCO_3$)	00435			Foam (extractables (mg/l)	00556	
Total Solids, Total (mg/l)	00500			Total Coliform/100 ml	31506	
Volatile	00505			Fecal Coliform/100 ml	31614	
Fixed	00510			Fecal Coliform/100 ml	31615	
Suspended Solids,Total (mg/l)	00530			Metals		
Volatile	00535		U	Cadmium		10-
Fixed	00540		U	Copper		10-
Dissolved Solids, Total (mg/l)	00515		U	Iron		190
Settleable Solids (ml/l)	00545		U	Lead		25
Chloride (mg/l)	00940		U	Zinc		20
Hardness, EDTA (mg/l as $CaCO_3$)	00900			Particle Size		8
Nitrogen, Total Kjeldahl (mg/l)	00625		U	Mercury		100-
Phosphorus, Total (mg/l) as P	00665					
Phosphorus, Ortho (mg/l) as P	00671					
Ammonia (mg/l as N)	00610					
Nitrate (mg/l as N)	00620					
Nitrite (mg/l as N)	00615			Other		
[illegible] (mg/l)	00945					
Fluoride (mg/l)	00951					
BOD_5 (mg/l)	00310					

JUN 15 1981

Date released from Lab: _____ Checklist: _____

100195

[illegible] Richmond, Va. [illegible]

FIELD AND LABORATORY DATA

JUN 26 1981

VALLEY REGIONAL OFFICE

6

2	3 GW	4 SS	5 P	6 PC	7 FK
					X

FK SS PC PS BM OR BIO NO.: 81-086

LATITUDE:

LONGITUDE:

BASIN: | STREAM: | RIVER MILE: | FLOW SEVERITY (01351):

TIDE (00067): | % FRR (00002): | DEPTH (FT): | SECTION: | REGION: 6

MONTH DAY YEAR: 05 22 81 | TIME: 0600 | SOURCE:

DISSOLVED OXYGEN (00300): | FLOW CFS (00061): | WEATHER (00041): | TEMP °C (00010):

Cl_2 RESIDUAL (TOTAL) (50060): | FIELD pH (00400): 7.0

Collected by: Frame

Waterbody: Tye River

Station Description: Rt. 739 Bridge – Tye River

Topo Name:

PARAMETER	STORET CODE	VALUE
pH (Laboratory)	00403	6.8
Alkalinity (mg/l as $CaCO_3$)	00410	8
Acidity (mg/l as $CaCO_3$)	00435	
Total Solids, Total (mg/l)	00500	
Volatile	00505	
Fixed	00510	
Suspended Solids, Total (mg/l)	00530	
Volatile	00535	
Fixed	00540	
Dissolved Solids, Total (mg/l)	00515	
Settleable Solids (mg/l)	00545	
Chloride (mg/l)	00940	5
Hardness, EDTA (mg/l as $CaCO_3$)	00900	
Nitrogen, Total Kjeldahl (mg/l)	00625	.1
Phosphorus, Total (mg/l) as P	00665	[illegible]
Phosphorus, Ortho (mg/l) as P	00671	.01
Ammonia (mg/l as N)	00610	.1
Nitrate (mg/l as N)	00620	.05
Nitrite (mg/l as N)	00615	0.01
[illegible]ts (mg/l)	00945	8
Fluoride (mg/l)	00951	
BOD_5 (mg/l)	00310	

PARAMETER	STORET CODE	VALUE
COD (mg/l)	00340	L
Total Organic Carbon (mg/l)	00680	
Freon Extractables (mg/l)	00556	
Total Coliform/100 ml	31506	
Fecal Coliform/100 ml	31614	
Fecal Coliform/100 ml	31616	
Metals		
Pesticide/Herbicide		
Other		

Date released from Lab: JUN 15 1981 Chemist: [signature]

100196

P. O. Box 11143, Richmond, Va. 23230

JUN 25 1981

FIELD AND LABORATORY DATA

6

3 GW	4 SS	5 P	6 PC	7 FK
				X

FK SS PC PS BM OR BIO NO.: 81-086

LATITUDE:

LONGITUDE:

005132 MAY 23 81

RECEIVED JUN 26 1981

VALLEY REGIONAL OFFICE

BASIN: STREAM: RIVER MILE: FLOW SEVERITY: (01351)

TIDE (00067): % FRB (00002): DEPTH (FT): SECTION: REGION: 6

Collected by: Eveml

Waterbody:

Station Description: Titanium Disch

Topo Name:

RECEIVED BSTS

MONTH	DAY	YEAR	TIME	SOURCE
05	22	81	0700	

DISSOLVED OXYGEN (00300): FLOW CFS (00061): WEATHER (00041): TEMP °C (00010):

Cl_2 RESIDUAL (TOTAL) (50060):

FIELD pH (00400): 4.58

PARAMETER	STORET CODE	VALUE
pH (Laboratory)	00403	
Alkalinity (mg/l as $CaCO_3$)	00410	
Acidity (mg/l as $CaCO_3$)	00435	
Total Solids, Total (mg/l)	00500	
Volatile	00505	
Fixed	00510	
Suspended Solids, Total (mg/l)	00530	
Volatile	00535	
Fixed	00540	
Dissolved Solids, Total (mg/l)	00515	
Settleable Solids (ml/l)	00545	
Chloride (mg/l)	00940	
Hardness, EDTA (mg/l as $CaCO_3$)	00900	
Nitrogen, Total Kjeldahl (mg/l)	00625	
Phosphorus, Total (mg/l) as P	00665	
Phosphorus, Ortho (mg/l) as P	00671	
Ammonia (mg/l as N)	00610	
Nitrate (mg/l as N)	00620	
Nitrite (mg/l as N)	00615	
Sulfate (mg/l)	00945	
Fluoride (mg/l)	00951	
CO_2 (mg/l)	00310	

PARAMETER	STORET CODE	VALUE
COD (mg/l)	00340	
Total Organic Carbon (mg/l)	00680	
Freon Extractables (mg/l)	00550	
Total Coliform/100 ml	31506	
Fecal Coliform/100 ml	31614	
Fecal Coliform/100 ml	31616	
Metals		
Cr		160
Cu		320
Fe		1200
Pb — Interference (ASV)	Og dA	100
Zn		3900
Pesticide/Herbicide		
Ni		2100
Other		

Date released from Lab: JUN 15 1981 Chemist: [illegible signature]

100197

INDIVIDUAL'S EXPENSE

FIELD INVESTIGATION

POLLUTION COMPLAINT NO. [illegible] FISH KILL NO. [illegible]

NAME: [illegible]

TITLE: [illegible]

WAGE EARNINGS PER HOUR AT TIME OF INVESTIGATION 10.53

TOTAL MAN-HOURS IN FIELD 12.5

TOTAL WAGE EXPENSE BASED ON HOURLY RATE $131.63

TYPE OF VEHICLE USED BY YOU PERSONALLY (AGENCY, POOL, OR PRIVATE)
TOTAL MILEAGE 250 COST PER MILE .11

TOTAL EXPENSE FOR VEHICLE USE $27.50

TYPE OF BOAT USED BY YOU PERSONALLY _____

RATE FOR BOAT USE:	DAILY COST	HOURLY OPERATING COST
CANOE AND FLATBOTTOM (NARROW)	$ 6.25	$ 3.00
WIDE FLATBOTTOM	8.50	4.00
GLASSMASTER 17' OUTBOARD	15.00	6.50
GLASSMASTER 19' OUTBOARD	25.00	7.50
GLASSMASTER 19' INBOARD	31.00	8.50
CAROUSEL	31.00	8.50
FISH/SKI, T-CRAFT	37.00	9.00

NUMBER OF DAYS BOAT WAS USED 0
NUMBER OF HOURS BOAT WAS USED 0 TOTAL EXPENSE FOR BOAT USE ..... —

TOTAL NUMBER OF NIGHTS SPENT IN FIELD 0
TOTAL EXPENSE FOR LODGING .....
TOTAL NUMBER OF MEALS 2
TOTAL EXPENSE FOR MEALS $10.00

EQUIPMENT USED (SOLVENTS, HAY BALES, WIRE, BOOMS, ETC.) ITEMIZE BELOW:

ITEM(S)	COST PER UNIT	TOTAL COST

TOTAL EXPENSE FOR EQUIPMENT ..... —

MISCELLANEOUS ITEMS (ICE, FILM, TOLLS, ETC.) ITEMIZE BELOW:

TOTAL EXPENSE FOR MISCELLANEOUS ITEMS .....

EFFECTIVE DATE: [illegible] TOTAL EXPENSES $169.13

SIGNATURE: [illegible]

DATE: _____

100198

INDIVIDUAL'S EXPENSE

FIELD INVESTIGATION

POLLUTION COMPLAINT NO. 81-667 FISH KILL NO. 81-086

NAME: Dwight M. Sours

TITLE: Pollution Control Specialist A

WAGE EARNINGS PER HOUR AT TIME OF INVESTIGATION $7.71

TOTAL MAN-HOURS IN FIELD AND/OR REPORT WRITING 10.5

TOTAL WAGE EXPENSE BASED ON HOURLY RATE 80.96

TYPE OF VEHICLE USED BY YOU PERSONALLY (AGENCY, POOL, OR PRIVATE)
TOTAL MILEAGE N/A COST PER MILE N/A

TOTAL EXPENSE FOR VEHICLE USE ..... N/A

TYPE OF BOAT USED BY YOU PERSONALLY N/A

RATE FOR BOAT USE:	DAILY COST	HOURLY OPERATING COST
CANOE AND FLATBOTTOM (NARROW)	$ 6.25	$ 3.00
WIDE FLATBOTTOM	8.50	4.00
GLASSMASTER 17' OUTBOARD	15.00	6.50
GLASSMASTER 19' OUTBOARD	25.00	7.50
GLASSMASTER 19' INBOARD	31.00	8.50
CAROUSEL	31.00	8.50
FISH/SKI, T-CRAFT	37.00	9.00

NUMBER OF DAYS BOAT WAS USED N/A
NUMBER OF HOURS BOAT WAS USED N/A TOTAL EXPENSE FOR BOAT USE ..... N/A

TOTAL NUMBER OF NIGHTS SPENT IN FIELD N/A
TOTAL EXPENSE FOR LODGING ..... N/A
TOTAL NUMBER OF MEALS 1
TOTAL EXPENSE FOR MEALS $5.20

EQUIPMENT USED (SOLVENTS, HAY BALES, WIRE, BOOMS, ETC.) ITEMIZE BELOW:

ITEM(S)	COST PER UNIT	TOTAL COST

TOTAL EXPENSE FOR EQUIPMENT ..... N/A

MISCELLANEOUS ITEMS (ICE, FILM, TOLLS, ETC.) ITEMIZE BELOW:

TOTAL EXPENSE FOR MISCELLANEOUS ITEMS ..... N/A

EFFECTIVE DATE: 5/26/81 TOTAL EXPENSES $86.16

SIGNATURE: Dwight M. Sours

DATE: 5/26/81

100199

S EXPENSE

INVESTIGATION

POLLUTION COMPLAINT NO. 81-667 FILE NO. 81-086

NAME: J.A. Fromal, III

TITLE: Pollution Control Engineer A

WAGE EARNINGS PER HOUR AT TIME OF INVESTIGATION: 9.61

TOTAL MAN-HOURS IN FIELD 20
and/or Report Writing

TOTAL WAGE EXPENSE BASED ON HOURLY RATE 192.20

TYPE OF VEHICLE USED BY YOU PERSONALLY (AGENCY, POOL, OR PRIVATE)
TOTAL MILEAGE 400 COST PER MILE 20¢

TOTAL EXPENSE FOR VEHICLE USE ..... $ 80.00

TYPE OF BOAT USED BY YOU PERSONALLY ..... NA

RATE FOR BOAT USE:

	DAILY COST	HOURLY OPERATING COST
CANOE AND FLATBOTTOM (NARROW)	$ 6.25	$ 3.00
WIDE FLATBOTTOM	8.50	4.00
GLASSMASTER 17' OUTBOARD	15.00	6.50
GLASSMASTER 19' OUTBOARD	25.00	7.50
GLASSMASTER 19' INBOARD	31.00	8.50
CAROUSEL	31.00	8.50
FISH/SKI, T-CRAFT	37.00	9.00

NUMBER OF DAYS BOAT WAS USED
NUMBER OF HOURS BOAT WAS USED TOTAL EXPENSE FOR BOAT USE ..... NA

TOTAL NUMBER OF NIGHTS SPENT IN FIELD
TOTAL EXPENSE FOR LODGING .....
TOTAL NUMBER OF MEALS 2
TOTAL EXPENSE FOR MEALS ..... $ 8.57

EQUIPMENT USED (SOLVENTS, HAY BALES, WIRE, POSTS, ETC.) ITEMIZE BELOW:

ITEM(S)	COST PER UNIT	TOTAL COST

TOTAL EXPENSE FOR EQUIPMENT ..... NA

MISCELLANEOUS ITEMS (ICE, FILM, TOLLS, ETC.) ITEMIZE BELOW:

TOTAL EXPENSE FOR MISCELLANEOUS ITEMS ..... NA

EFFECTIVE DATE: 5/28/81 TOTAL EXPENSE 280.77

SIGNATURE: J. A. Fromal III

DATE: 5/28/81

100200

INDIVIDUAL'S EXPENSE

FIELD INVESTIGATION

POLLUTION COMPLAINT NO. 81-667 FISH KILL NO. 81-096

NAME: BRIAN HARRISON

TITLE: FC SPEC A

WAGE EARNINGS PER HOUR AT TIME OF INVESTIGATION 7.70

TOTAL MAN-HOURS IN FIELD 12

TOTAL WAGE EXPENSE BASED ON HOURLY RATE 92.40

TYPE OF VEHICLE USED BY YOU PERSONALLY (AGENCY, POOL, OR PRIVATE)
TOTAL MILEAGE ______ COST PER MILE ______

TOTAL EXPENSE FOR VEHICLE USE .... ______

TYPE OF BOAT USED BY YOU PERSONALLY ______

RATE FOR BOAT USE:	DAILY COST	HOURLY OPERATING COST
CANOE AND FLATBOTTOM (NARROW)	$ 6.25	$ 3.00
WIDE FLATBOTTOM	8.50	4.00
GLASSMASTER 17' OUTBOARD	15.00	6.50
GLASSMASTER 19' OUTBOARD	25.00	7.50
GLASSMASTER 19' INBOARD	31.00	8.50
CAROUSEL	31.00	8.50
FISH/SKI, T-CRAFT	37.00	9.00

NUMBER OF DAYS BOAT WAS USED ______
NUMBER OF HOURS BOAT WAS USED ______ TOTAL EXPENSE FOR BOAT USE .... ______

TOTAL NUMBER OF NIGHTS SPENT IN FIELD ______
TOTAL EXPENSE FOR LODGING .... ______
TOTAL NUMBER OF MEALS 2
TOTAL EXPENSE FOR MEALS 7.50

EQUIPMENT USED (SOLVENTS, HAY BALES, WIRE, BOOMS, ETC.) ITEMIZE BELOW:

ITEM(S)	COST PER UNIT	TOTAL COST

TOTAL EXPENSE FOR EQUIPMENT .... ______

MISCELLANEOUS ITEMS (ICE, FILM, TOLLS, ETC.) ITEMIZE BELOW:

TOTAL EXPENSE FOR MISCELLANEOUS ITEMS .... ______

EFFECTIVE DATE: 5-23-81 TOTAL EXPENSES 99.90

SIGNATURE: Brian Harrison

DATE: May 29, 1981

100201

FISH KILL REPORT/NOTIFICATION

Fish Kill Number 81-086 City/County Nelson Co.

Stream Piney & Tye Rivers Date Investigated 5-22 & 23-81

Basin James River Investigator J.A. Fromal, III

Region Valley

Reported by: Name Robert Parton

Address

Phone (804) 263-5512

Reported to: Name Ms. Lamplee

PBeP Central

Fish Killed (common name) Suckers, Bass, Minnows Date Kill Started Probably 5-19-8

Number Killed 2482 Date Kill Ended Probably 5-20-

Length/area Involved @least 11 miles Total Cost Investigation 664.46

Cause of Kill Unknown - Suspect runoff from U.S. Titanium Property Man Hours 55

Exact Location of Kill Piney River 2 miles below U.S. Titanium to at least 11 miles below discharge on the Tye River

Other: SEE Attached MEMO

Date 5/28/81 Investigator's Signature [signature]

Recommendations:

Division of Ecological Studies Lab data indicates samples of river taken after toxic slug had passed. Circumstances similar to past kills caused by runoff from U.S. Titanium.

Date Signature

Enforcement

Date Signature

Fish Kill Distributed (Date)

7 Copies: DES, BSFS Dir., Enf., Region, CGH, HAES File, Fish Kill File (orig)

Form 12-75

100202